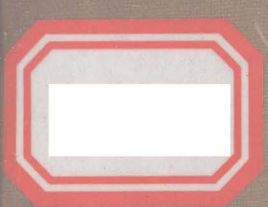
ACUTE INJURIES OF THE HEAD

POWER

FOURTH EDITION



LIVINGSTONE

ACUTE INJURIES OF THE HEAD

THEIR DIAGNOSIS, TREATMENT, COMPLICATIONS AND SEQUELS

BY

G. F. ROWBOTHAM

Newcastle upon Tyne

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With a Foreword by

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FOURTH EDITION

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FOREWORD

THIS admirable volume is *the* British text on head injuries; and it is a work in which British medicine may take just pride. While the authorship has been advisedly extended, it remains a commendably personal work; and it is so well presented that we view its wide range through the author's alert and penetrating vision and with the aid of his exceptional experience.

This is a work informed by a crusader's zeal and sincerity, tempered by wisdom and a respect for scientific accuracy; and it approaches, as nearly as mortal may, the truth, the whole truth and nothing but the truth.

The principal author acknowledges in numerous, sundry places the extent of his indebtedness to his great preceptor, the late Sir Geoffrey Jefferson, to whom earlier editions were dedicated. I know that the author would like me to say here that it all began with Sir Geoffrey. "Row" was his first apprentice in surgical neurology—professionally his first-born son. The master had an outlook on the importance of brain injuries, and of the neurological surgeon's duty in relation to them, far in advance of his time. The young "Row," taking wing from the nest at Manchester to serve his new territory at Newcastle upon Tyne, carried this ideal next to his heart, and, among many pre-occupations, he developed it with missionary fervour. He seized every opportunity that presented—and what is greater—he created opportunity—to assemble, to care for and to study the victims of head injury; and to illumine their problem with the larger lamps of surgical neurology, neuropathology and medical sociology. He has done this so successfully that he has achieved quite exceptional experience in this field. The first edition of *Acute Injuries of the Head* in 1942 was a printed manifesto of his mission to bring succour to the head-injured. As time and the reaper have moved on, the original, face-page dedication to Sir Geoffrey Jefferson has been honourably transferred to the admirable, opening Historical Introduction. The new dedication is very properly addressed to that Alma Mater who adopted our author and further nurtured him. British medicine and the British people owe much to the author for his leadership in the surgical care of the head-injured. It is in no small measure due to his works that the claims of the head-injured, and the means by which they should be met, have become recognised. And, as the alarming problem increases to-day, with faster transport and more mechanisation, the author presents us with this valuable treatise on how to meet it.

For the medical student it will prove an informative thriller, for the young graduate an inspiring guide, for the mature graduate a useful mentor and a work of reference on hospital medicine, neurology and social medicine, for the surgical neurologist a mine of information and a dear companion.

This work has grown in scope, quality, maturity and size with its author; and this advancement is especially remarkable in this, the fourth, 1964 edition. It is a matter for congratulation that this has been achieved with an increase of no more than one hundred pages—467 pages in the third edition and 569 pages in

the present one. The new sections—historical, statistical, special physiological, radiological and on applied electro-physiology, wisely chosen and of high quality—are by some of his new collaborating authors ; several sections of the former edition have been completely rewritten to great advantage by others—notably those on pathology, epilepsy and rehabilitation. Nor has the editor allowed himself to rest on editing alone. His own section on the management of the unconscious head-injured has also been completely rewritten in the light of advances of the past fifteen years. In other areas of knowledge there has been less change, and these sections largely retain the excellence of the original text. Most of the collaborating authors are of the principal author's immediate colleagues ; and this has no doubt facilitated the attainment of the admirably homogeneous nature of this book. Yet the editor has not hesitated to range further afield where he felt this to be advantageous for his readers ; and thus we find collaborating authors from India, the United States of America and Norway, and in Britain from Birmingham and Cambridge.

This is no reprinting of an old book, with a few bits added here and there. It is a complete and streamlined re-editing and rewriting ; and it is " up to the minute." Discussions and reports that appeared within the past few months appear equally with those of 600 B.C. The literature of the subjects dealt with has been carefully selected for mention and is amply and accurately referred to.

The streamlining has not been achieved without painful excisions. This has necessitated omission, for example, of the lovely view from the rehabilitation centre in the Cheviot Hills, and of the personal loyalties and reminiscences of the staff there. Such omissions are a little saddening to an old friend, such as I ; but, as time passes, they are necessary and wise.

The book is enhanced by some of his little foibles—as in his penchant for philosophical speculation ; and its sterling worth is not depreciated by others—his persistent references to " degrees of unconsciousness "—we always know exactly what he means.

I consider it a signal honour to have been given the opportunity of introducing this volume and its author to the many and varied who will read it.

NORMAN M. DOTT.

EDINBURGH,
1964.

PREFACE TO FOURTH EDITION

NOT only are accidents increasing in numbers, the resulting damage to man is severer, more extensive and complicated than hitherto. Moreover, it is the young and healthy that are prone to injury, and for the obvious reason that they are engaged in pursuits where accidents are liable to occur. That the accident rate and sequels of injury have become the concern of the health services is evidenced by the reports of a sub-committee of the Ministry of Health and Accident Review Committee under the Chairmanship of Sir Harry Platt and Mr Osmond-Clarke respectively. Schemes organised by the Regional Boards of the Ministry of Health are already afoot to set up comprehensive accident services including rehabilitation. Extensive reviews of accidents have been made by many bodies with a view to calling attention to the factors that cause them. Also, the forces that inflict bodily damage have been analysed so that machinery, for example motor cars, can be so designed that injury is minimised should accidents occur. That avoidance of accidents should be the primary aim is an ideal with which no one will cavil. However, this book is concerned with the management of people already injured about the head and therefore the emphasis must of necessity be on cure rather than on prevention. It is fully realised that it may be read by men at different levels of surgical experience and in clinics where, for a time, facilities must vary in quality. The Universities, the Royal Surgical Colleges and the Ministry of Health are fully aware of the importance of accident surgery and it is hoped that this book will be found useful at the four stages of teaching—undergraduate, pre-Fellowship, Fellowship and consultant. Several experts in particular fields have been asked to contribute to this new edition and I am thankful for their ready co-operation. However, though the authorship has been broadened, every effort has been made to maintain the continuity of the story of the head injury as cherished in the earlier editions and to avoid imbalance.

From the technical point of view the book was written for those whose responsibility it is to succour people injured about the head, whether they carry out their duties in comprehensive accident centres or in isolated units less favourably equipped and staffed. In this new edition it is hoped that perusal of isolated chapters may not only be useful but excite interest in a subject with so many engaging facets.

The enigma of concussion remains with us in all its puzzling aspects. To-day, as yesterday, no more precision can be given to the meaning of the word than it connotes an impairment of consciousness that has resulted from an injury to the brain. Since, however, when studying head injuries, we are primarily and basically concerned with the state of unconsciousness, it might be salutary first of all to try and decide what information we are in fact seeking when consciousness is impaired. Herein lies the first difficulty because it is quite impossible precisely to define this state, though most clinicians rightly believe they can detect it at a glance. This, in a way, is a paradoxical situation. Furthermore, there are different degrees of unconsciousness ranging from slight confusion to deep coma, and it is difficult

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to know whether or not these separate states are or are not different degrees of the same state or quite separate entities. Also, we must perforce ask what relationship has unconsciousness to consciousness. The state of consciousness is recognised and defined by certain features—awareness of environment and contactability—that are lacking in the state of unconsciousness. In other words the definition of unconsciousness is negative in nature. An advance would be to produce a positive definition. In any case it probably would always be nearer to the truth to refer to the states rather than the state of unconsciousness. Whether differences in states of unconsciousness depend on different degrees of injury in the same neurological mechanisms or on different mechanisms no one has as yet made absolutely clear. But this puzzle obviously has to be solved if we are to seek for an anatomical basis for concussion. Associated brain damage in areas not primarily concerned with consciousness of course add further complexity to our problem. Compression of the brain by surface hæmorrhage is a well-known phenomenon but does not enter these considerations.

It will be seen therefore how great the histological difficulties are when one sets out in the post-mortem room or experimental laboratory to seek for damage in some particular part of the brain that will account for concussion or post-traumatic impairments of consciousness, and particularly if one hopes to find that the areas of damage are of a particular shape and size. In the cases that come to post-mortem a vital lesion at the seat of concussion no doubt is obscured in an excess of cerebral damage.

Whether injuries of sub-microscopical dimensions are due to ischæmia or to disturbance of ionic interchange along the cell membranes can only be a matter for speculation, but this puzzle may be resolved in the light of recent discoveries on the nature and conduction of the nerve impulse.

I would like particularly to thank Mr Patrick R. R. Clarke, who has acted as sub-editor to this fourth edition, for his energetic and wise counsel. He also owes much to Mrs V. L. Robinson, Dr H. L. Leeming and Dr R. Blowers for the help they gave him.

The chapter on injuries to the blood vessels of the brain was started by my dear colleague and friend Norman Whalley, but was brought to a halt by his untimely death. It was ultimately completed by Patrick Clarke.

I am most grateful to Mr Frederick Mattar, President of the Medical Appeal Tribunal, Newcastle upon Tyne, for all the help that he has given me on legal matters.

Again the quality of Mr D. P. Hammersley's artistic work speaks for itself, and I am thankful not only for his skill but for all the personal things he has contributed.

Mr John Rogers and Mr George Leslie, both of the Department of Surgery, University of Newcastle upon Tyne, were as always ready to help when technical assistance was required. To them I cannot express my thanks anything like adequately in a few words.

Without the encouragement and loyal aid of my own staff, Mrs A. Burt, Mrs M. Dodds, and Mrs E. C. Smalley, it is unlikely that this new edition would ever have been produced.

For the generous facilities that have been given me and my staff in the Regional Neurological Centre at Newcastle General Hospital for the study of cerebral trauma, I shall always be grateful to the Hospital Board, Region No. 1, and the Newcastle upon Tyne Hospital Management Committee.

Finally, I would like to thank Mr Charles Macmillan for his ready co-operation and advice in the production of this fourth edition.

G. F. ROWBOTHAM.

FAIRHOLME,
WYLAM,
1964.

PREFACE TO THIRD EDITION

THE 1939-45 war has now so long passed that it is possible to view the surgical activities of that period in dispassionate perspective; in particular, let us review the part that neurological surgery played in the succour of the wounded, not only on foreign fields but on the home battle fronts.

I remember vividly the Meeting of the British Neurological Surgeons at Oxford in 1939; peace was in obvious danger and our thoughts turned excitedly to preparations of war; British and American neurologists were discussing the advisability of their attending the coming International Neurological Congress in Copenhagen. We know how many did, in fact, cross the North Sea, to return precipitately at the suggestion of His Majesty's Government before even having read their papers. What a haul of clinical scientists the Nazis could have had, had they so desired!

I remember the commotion at the International Neurological Congress held in London when the venue for the next meeting was being discussed, and I like to believe that it was I who suggested indirectly to Gordon Holmes that the "Ayes" to go to Copenhagen should sit on one side of the hall, thereby rendering the counting of the votes more easy than a show of hands. We little realised then what heavy days lay ahead of us. I wonder what would have happened had by chance Paris been chosen as the meeting-place and not Copenhagen. Would the Nazis have been as considerate as they seem to have been in Denmark?

Britain, at the outbreak of war, was fortunate in having the services of Jefferson, Cairns and Dott. Sir Hugh Cairns (Nuffield Professor of Surgery at Oxford) was given charge of the Neurosurgical Services of the Army, Professor Jefferson was made head of the Neurosurgical Services of the Emergency Medical Services in England and Professor Dott head of a similar organisation in Scotland.

When the time came and the right circumstances developed these three men threw out broad opportunities that younger generations readily accepted and with initiative and skilled hands put to excellent use, as the results tabulated in a later chapter will testify.

The most important decisions in planning resulted from the fundamental belief that, to obtain the best results in the treatment of open head wounds, early and complete surgery is essential. It was this conviction that led to the formation of the mobile neurological teams (M.N.S.U.), and the main credit for this is due to Cairns. Willie Henderson was put at the head of the first team, and it was he who worked out details of tactics. Together with George Smyth (neurologist), Martin Nicholls (assistant neurosurgeon), Captain Travener and John Challis (anæsthetist) he took out a team to Flanders in 1940. Later in that year this team stood by 800 of their wounded patients and were taken prisoner and spent years of captivity in Germany. There was ample time for them to escape had they so wished; it was the sense of their responsibility that kept them at their posts. When the war was

over and these men returned—Henderson to Leeds, Smyth to Manchester and Nicholls to Glasgow and later to Aberdeen—it was soon seen that their experience had failed to leave on them a single psychoneurotic mark. Accounts of the work of later teams can be perused in the very interesting and informative chapter, written by Hugh Cairns, in the War Surgery Supplement No. 1 of the *British Journal of Surgery*.

At the beginning of the war England and Wales were divided into eleven medical regions, Scotland forming a separate zone. Each region was given a neurosurgical service. These neurosurgical services were often combined with neurology, and in all instances psychiatric co-operation was close. The duties of the neurological surgeon were to treat, house and rehabilitate the head-injured of air-raid casualties ; to help the medical organisations of the three Services when necessary ; and to give general neurosurgical services to their region in the time that was left over to them. In order to handle the casualties of the North-West European campaign, three experienced neurological surgeons (Northfield, McKissock and O'Connell) were drafted to strategic points in the South of England.

By the nature of things the neurosurgical service of the E.M.S. has had little publicity ; it has, however, been happy to regard itself as the silent service.

The Canadian Neurosurgical Unit was based at Basingstoke. At first it was under the surgical guidance of William Cone of Montreal, a firm believer in early complete surgery. However, most of its active work was done when Harry Botterell of Toronto was at its head. Of the Canadians, much was naturally expected, and we are indebted to them for other things besides their surgical skill and ability to organise ; they came early and without stint when this country was in trouble ; to us here it was a tower of strength to see them already lined up during the inactive and trying period of the " twilight " war.

Let us now consider the advances that were made in neurosurgery and the lessons to be learnt. The fundamental importance of early complete surgery has again been made obvious ; indeed, the excellence of the neurosurgical results were largely attributable to this policy.

Jefferson and Cairns were both convinced of the value of the academic approach to practical problems ; indeed, the ready co-operation of pure and technological scientists was one of the outstanding features and successes of the past war.

Blood transfusion not only saved lives but materially lowered morbidity rates by raising a patient's resistance before infection could get a foothold. From figures to be given later, it will be seen that a large percentage of open head wounds were firmly closed at the first débridements and that primary healing was obtained in most instances. To what extent this success was due to chemotherapy cannot be known with certainty, but to judge from first principles and past experience it must have been considerable. On the other hand it must be appreciated that chemotherapy loses much of its efficacy if the surgical excision of a wound has been inadequate or faulty. When infection has once become established chemotherapy is life-saving.

Correct rehabilitation and formal psychiatric assessment has led to a higher percentage of recoveries and to speedier return to duty or to work than hitherto.

I believe that rehabilitation is an essential part of the treatment of the head-injured, and that without it the long-term results of closed head injuries will remain unsatisfactory.

The problems of peace time, however, are very different from those of war. In war, the surgeon is largely concerned with the prevention and treatment of infection and with the repair of holes in the head. As a result, surgical publications relating to the war period have been largely concerned with the nature, treatment, complications and sequels of open wounds of the head. Relatively little has been written on the closed head injury, and it is with this subject that this book is primarily concerned. I should like, therefore, to set out the problem as I see it and to attempt to dispel some current misconceptions.

The problem has the following aspects :—

1. The physics of the injury.
2. The period during which the patient's life is in danger.
3. The stage of convalescence.
4. Medical rehabilitation.
5. Industrial rehabilitation.
6. The final medical assessment and the advice to the patient regarding his return to work.

Although on the physics of closed injuries good work has been done, no new concept has emerged. That the neurones could be damaged by movements of the brain in relation to the skull was known long before the last war. The problem has become largely one of pure mathematics, and further experimental studies with new methods of inflicting trauma are unlikely in themselves to throw new light on the problem of concussion.

The neurological complexes and the physical injuries of the brain that result from the forces of rotational and linear acceleration are indistinguishable from those that arise from slow squashing deformations of the head such as occur in the mines from falls of coal. The essential force that causes concussion is distortion. Also, it must be clearly understood that the lesions of an acute head injury are not those merely of commotio cerebri or of concussion—or, better, of diffuse neuronal injuries. Diffuse neuronal injury is usually one of the phenomena resulting from injuries of the head, and very often in itself does not cause death.

By definition, concussion means unconsciousness that has resulted from cerebral trauma. It should mean nothing more ; it does not connote any known or hypothetical neuronal pathological state that can account for impairment of consciousness or for the many other possible abnormal neurological signs. The term " commotio cerebri," on the other hand, implies the existence of a lesion, although its precise nature is not known.

At autopsy on patients who died from head injuries it is often obvious that gross lesions such as contusions and hæmorrhages cannot account for the neurological signs that were observed clinically. Therefore, disordered function must have occurred in neurones distant from areas of damage of the degree that can be seen by naked eye. We know little of the nature of these neuronal changes ;

we likewise know nothing of the phenomenon where a reversible injury becomes irreversible and we are uncertain as to the exact anatomical site of neurones whose disordered function gives rise to the variegated neurological signs. It is to the solution of these problems that I would call the attention of those who wish to do research work on head injuries. Enough has been said on the physics of injury. To medical observers other than neurologists I would point out how fascinating it is to sit by the bedside of a man with a head injury and witness the return of consciousness. The time has now come when we should try to become a little clearer in our minds on what we think of unconsciousness ; is unconsciousness a positive neurological condition or is it merely a negative one implying an absence or impairment of consciousness ?

To return to the therapeutic point of view, the acute head injury problem is by no means that merely of diagnosis and treatment of diffusely scattered microscopical neuronal injuries. The acute head injury results in a variable combination of pathological states, some of which in themselves are lethal but which are often amenable to surgical or to active medical treatment.

That the subject of the acute head injury concerns others beside the neurosurgeon is one of my main themes ; everyone, from those interested in the link between the brain and the mind to those who have to use their skill, administrative or technical, in the prevention of accident, must be recruited in the solution of the many problems that arise.

On more than one occasion, and in more ways than one, scholars of the past have reminded us, as did Santayana, that " Those who cannot remember the past are condemned to repeat it." A study of past experiences can help in two ways in planning for the future, negatively and positively. By negation we know what errors not to repeat. There is, however, a danger in viewing the past to come to negative conclusions only, when more harm than good can accrue through the omission of imagination and of anticipation. We must try to foresee what future requirements will be ; we need to know more than what to avoid ; to know what to do should be our aim. In any future war may not the artificial sunlight lamp, for example, be as important as the scalpel ?

Now to the pleasant task of thanking all those who have helped in the production of this third edition.

My neurosurgical unit was born and grew under the goodwill of my friends Dr J. A. Charles, of the Ministry of Health, and Professor F. J. Nattrass, Professor of Medicine at the Newcastle upon Tyne Medical School. To these two gentlemen neurological surgery of the North-East owes much. The surgeon cannot do his best without encouragement and opportunity ; I have received both in good measure from both these friends and I thank them.

I should also like to take this opportunity of saying good-bye to the Medical Officers of Health of the North-East Region, through whose ready co-operation I was able to concentrate my work in one clinic ; in particular, I would mention Dr Walton, Medical Officer of Health of Newcastle upon Tyne ; Dr McCracken, Medical Officer of Health of the County of Durham ; Dr Tilley, Medical Officer of Health of the County of Northumberland ; and Dr Grant, Medical Officer of Health

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of Gateshead. I am also indebted to Dr Hurrell, Medical Superintendent of the Newcastle General Hospital, for his helpful co-operation.

For the new coloured photographs of the pathological specimens my thanks are due to Mr Dudfield Rose of the Newcastle Royal Victoria Infirmary. I have also to thank Mr Gordon Hilton for his clinical photography.

I am again indebted and grateful to my friend Dr Raymond Whitehead, of the Department of Pathology of the University of Manchester, for his help and criticisms in the production of this edition.

Miss Bousfield has helped me with each edition of this work and much credit is due to her. It would be difficult to overstate her part in the productions.

Once again my warm thanks are due to Mr Macmillan for his understanding and encouragement.

In the past I have been granted good facilities for recording observations and some for research ; I still need more of both.

Finally, I would gratefully acknowledge the help received through reviews of the second edition of this work ; I hope that I have profited from them and shall always welcome constructive criticism.

G. F. ROWBOTHAM.

FAIRHOLME,
WYLAM.
1949.

PREFACE TO SECOND EDITION

I BELIEVE that the next advance in the treatment of civilian head injuries after the war will be the closer co-operation between the general practitioner and the specialist, between the specialist and the Government and, finally, between the Government and industry.

This war has proved beyond doubt what some of us already knew, that for good results and early readjustment following a head injury, a man or woman must have continuous and co-ordinated treatment from the acute stages of injury until he or she has been finally resettled in employment, either in industry or in the home. The connecting links between the specialist and industry are already being forged, and I believe that centres for industrial rehabilitation, which will be of benefit to the whole community, will soon emerge. What will be lacking, however, if care is not taken, is close liaison between the general practitioner and the specialist. This important link was, unfortunately, weak before the war. Many general practitioners regarded acute injuries of the head as being beyond their scope and naturally tended to avoid taking responsibility for them, with the result that they were apt to be overawed by their seriousness and, consequently, had their scientific judgment coloured by impression and by the argument of anxious relatives.

The interests of an injured man must be protected, and no one can better do this than the general practitioner. It is, therefore, his duty at least to be acquainted with the basic principles of head trauma if he is not to give his important judgment merely on impression. I believe that any general practitioner will find perusal of this book not only of value but will find the subject interesting and even exciting.

Again, in this second edition I have endeavoured to make the story continuous and to avoid the temptation of overemphasising the unusual and dramatic. Moreover, I hope I have refrained from oversimplification at the expense of accuracy.

The theory of injury to the brain by the forces of rotation has been put into mathematical language by Dr Holbourn of Oxford, and this important subject is discussed in some detail in the first chapter. It is a problem in which I have long been interested and later I hope, with Dr Holbourn, to say something further on this matter.

Rehabilitation is the subject of a new chapter. It is a form of treatment that has come to stay; the principle is established; all that has to be done now is to decide on the details. My chapter on this subject deals with what rehabilitation is and how it is carried out and is not an attempt at its justification. The success of the centre at Callaly Castle has been due to the genius and sincerity of the Commandant, Mrs Heather Culley, and of the Matron, Miss Coulson. The necessary bulwark of democracy has been provided by the War Organisation of

the British Red Cross and Order of St John. May I now express the opinion that when planning for the future a Centre must be under the control of some person who is " big " enough to prevent it running the danger of losing its democratic identity.

As one circles around a complex subject and views it from different angles, slightly different conclusions about the same problems may be formulated. If these varying conclusions are written down in their contexts certain slight inconsistencies in the whole may result. It is on these apparent inconsistencies that the professional critic is so apt to pounce without fully realising how they arose.

In the Preface to the first edition of my book I omitted to express my thanks to Dr Boyes of Edinburgh, to Dr Wyse of Salford Royal Hospital and to Dr Whitehead of the Pathological Department of Manchester University for their careful perusal and correction of the proofs. I should like to thank them now.

To Dr Boyes and Mrs Condon I am particularly indebted for the meticulous care which they have taken in correcting the proofs of the second edition and I cannot say how much I appreciate all they have done.

Dr Walshe, Professor Jefferson and Mr Norman Dott have maintained and, to a large extent, set the high standards of neurological thought and neurosurgical procedure in this country, and I owe to them not only the benefits of criticism but also of precept.

To my Staff, past and present, of the Neurosurgical Centre at Newcastle upon Tyne I should like to express my appreciation of all the care they have taken in nursing the injured back to health, and to thank them for the patient aid they have given me in making detailed observations ; in particular, I should like to thank Dr Norman Whalley for his devoted and loyal assistance.

Since January 1941 every fatal case of head injury which has come under my care has been subjected to post-mortem examination. This essential part of the study of head injuries has been made possible through the interest and co-operation of Mr Bamburgh of the Autopsy Department.

To Professor Shaw of the Faculty of Pathology in the University of Durham I am most grateful for the detailed examinations of and reports on the many pathological specimens sent to him from my Unit.

Further drawings have been made by Miss Dorothy Davison, and again the quality of these speak for themselves. I regret that my old friend and colleague now finds it so difficult to come to Newcastle.

From Dr J. A. Charles, now of the Ministry of Health, and from Dr G. P. Harlan I have received that encouragement which is necessary when engaged in other than routine work.

I should also like to thank Professor Sir Francis Fraser of the Ministry of Health for his kind permission to use E.M.S. material.

Everyone is indebted to Miss Bousfield. It is she who has participated in the hard work of collecting data and checking references ; without her aid and skill in providing for me protected moments this work would not have appeared in this year.

Finally, to my friend Charles Macmillan I wish to say how much I appreciate

his skill, keenness and patient understanding. His motto is " A thing of beauty is a joy for ever." What a lot publishing owes to him.

The difficulty of writing a book is being allowed to write it. If any reward were forthcoming for the efforts I have made I would ask that I be granted reasonable facilities for research work in my own Unit and for a sound-proof room of my own.

G. F. ROWBOTHAM.

FAIRHOLME,
WYLAM.
1944.

PREFACE TO FIRST EDITION

THIS book has been written primarily for those who are responsible for the treatment of acute cerebral trauma and who have not received a special training in neurosurgery or in neurology. It will also be of value, I believe, to senior students about to be confronted with the complexities of injuries of the head in the near future.

An effort has been made to present a continuous picture of the various problems concerned, from the moment of the infliction of violence to the stage of complete recovery or of invalidism. This is important, since what happens in the acute phases materially affects what follows, both as regards complications and sequels.

In the chapter on diagnosis the temptation to oversimplify what is essentially a complex problem has been avoided, since anything but a true presentation of the facts only leads to confusion.

It has, of course, in a book of this size been impossible to cover every variety of fracture of the skull and cerebral injury, but I hope a starting-point has been made from which a rational approach to the subject is possible. The references are not exhaustive ; they were not meant to be so. They do, however, give an introduction to the literature on each of the subjects considered and will lead to most of the important ones not mentioned.

Most of the observations on which this book is based were made at the Stockport Infirmary, where the fullest facilities have always been granted me for clinical and research work. Many of the autopsies were done in conjunction with my friend Mr Andrew McGill, and by the courtesy of Mr Ferns, the Coroner.

To Dr F. M. R. Walshe I am sincerely grateful for reading the typescript and for the many valuable criticisms he made. I felt that if I could satisfy him I could await future judgments with confidence.

I would also like to thank Mr Norman M. Dott for much useful advice and encouragement in the early stages.

The drawings have all been made by Miss D. Davison, and to her I am most grateful, not only for her skill which speaks for itself but also for her patience.

To Mr Macmillan many writers in recent times must be thankful for the high standards he has set in publications, and I appreciate also his sustained understanding.

Without Miss Bousfield's and Miss Hudleston's help this book would never have been completed.

G. F. ROWBOTHAM.

FAIRHOLME,
WYLAM.
1942.

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