Watson-Jones

Fractures and Joint Injuries

Edited by
J. N. WILSON, Ch.M., F.R.C.S.

VOLUME I

Fifth Edition

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Consultant Orthopaedic Surgeon, Royal National Orthopaedic Hospital, London, and The National Hospitals for Nervous Diseases, Queen Square and Maida Vale; Surgeon in Charge of the Accident Unit, Royal National Orthopaedic Hospital, Stanmore; Honorary Orthopaedic Surgeon, Garston Manor Medical Rehabilitation Centre; Recognised Clinical Teacher, Institute of Orthopaedics, University of London; Fellow of the British Orthopaedic Association and the Royal Society of Medicine

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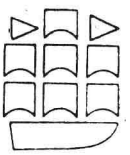

CHURCHILL LIVINGSTONE
Edinburgh London and New York 1976

CHURCHILL LIVINGSTONE
Medical Division of Longman Group Limited

Distributed in the United States of America by Longman Inc., 19 West 44th Street, New York, N.Y. 10036 and by associated companies, branches and representatives throughout the world.

First Edition	1940
Second Edition	1941
Second Edition Reprinted	1941
Third Edition	1943
Third Edition Reprinted	1944
Third Edition Reprinted	1946
Fourth Edition, Volume I	1952
Fourth Edition, Volume II	1955
Fourth Edition, Reprinted	1955
Fourth Edition, Volume II, Reprinted	1956
Fourth Edition, Volume I, Reprinted	1957
Fourth Edition Reprinted	1960
Fourth Edition Reprinted	1962
Fifth Edition	1976
Fifth Edition Reprinted	1977

ISBN 0 443 01105 2

Library of Congress Cataloging in Publication Data
Watson-Jones, Reginald, Sir, 1902–1972.
Fractures and joint injuries.
First–2d ed. published under title: Fractures and other bone and joint injuries.
Bibliography: p
Includes index.
1. Fractures. 2. Joints—Wounds and injuries.
I. Wilson, James Noel. II. Title.
RD 101.W28 1976 617'.15 75–7549

Printed in Great Britain by
T. & A. Constable Ltd., Edinburgh.

Dedication to the First Edition

TO
HUGH OWEN THOMAS
SIR ROBERT JONES
C. THURSTAN HOLLAND

They, whose work cannot die, whose influence lives on after them, whose disciples can perpetuate and multiply their gifts to humanity, are truly immortal.

I GRATEFULLY ACKNOWLEDGE

THE inspiration of those pioneers of orthopaedic surgery to whom this book is dedicated.
THE forbearance of my colleagues at the Liverpool Royal Infirmary, who sacrificed their own interests in encouraging the development of an organised fracture service, and the support of the Committee, of my friends, and of disinterested Insurance Companies, who rebuilt the Fracture Clinic.
THE stimulus and assistance of Dr Gwynne Maitland, who has never ceased to strive for the improvement of fracture treatment in this country.
THE loyalty and devotion to duty of Miss Hulme and all of my staff at Rodney Street, who have worked strenuously, tirelessly and cheerfully.
THE enthusiasm of succeeding teams of first assistants, house surgeons, radiographers and secretaries at the Royal Infirmary, who during the last twelve years have completed the clinical and radiographic records, and assisted in the treatment of 47,300 bone and joint injuries.
THE skill and artistry of Douglas Kidd, who has been responsible for all of the diagrams, half-tones and coloured illustrations.
THE tolerance of Messrs E. & S. Livingstone, who have allowed many liberties, the efficient, prompt and painstaking service of Mr Charles Macmillan, who has satisfied every whim, and the meticulous care of proof-readers, printers and engravers.

Liverpool, 1939 **R. WATSON-JONES**

(*Portrait by Dorothy Wilding, London*)

Sir Reginald Watson-Jones
1902–1972

Preface to the Fifth Edition

'Of making many books there is no end; and much study is a weariness of the flesh.'
Ecclesiastes, xii, 12

How right are the words of the preacher! It is now over ten years since Sir Reginald first asked me to co-operate with him in producing a fifth edition of *Fractures and Joint Injuries,* and nearly three years since the full burden of its production fell on my shoulders alone. Since then there have been times when the immensity of the task loomed so great, the responsibility to Sir Reginald so demanding, and the 'weariness of the flesh' so distracting that indeed there seemed no end to it. But now at last the book is finished. Its gestation has been long and its delivery much overdue; but like the mother just confined there is deep feeling of relief that the birth has been accomplished, and as yet this relief is untempered by anxiety over the future of the newborn.

It is always difficult, in fact it is well nigh impossible, to revise another author's work without losing something of its original character. Revising *Fractures and Joint Injuries* without the master at the helm has proved particularly difficult because the outstanding success of the book in the past has depended so much upon Sir Reginald's clear exposition and inimitable style. For this reason some have said that the book should not be revised, but should remain as a classic. There are many others, however, particularly amongst surgeons abroad, who feel that there is still a need for it as a standard working textbook, and that the revision is long overdue. It is for this reason that the work has been undertaken. Criticism is inevitable, for the book can never be as it was before. However, throughout the revision the conservative wisdom of Sir Reginald has been maintained whenever possible, and everywhere the emphasis has been laid upon the assistance of natural methods of healing, rather than the sacrifice of these to speed.

The new edition had already been planned some years before Sir Reginald's death and much of the preliminary work had been done by Sir Reginald and others; and I am particularly indebted to Mr R. C. Farrow for permission to use much of the text and illustrations which he had provided at that time. However, it has become necessary to review every chapter again and to bring up to date much of the material. Although a large amount of Sir Reginald's writing has been retained, and will be easily recognisable, several chapters have been completely rewritten and some new ones have been added. The magnitude of the task has been lessened considerably by the active co-operation of a number of my colleagues who have revised or written chapters on subjects in which they have a particular interest, and I am deeply grateful to them for delivering them punctually. Completely new chapters have been written on the systemic effect of injury; on early management of the injured; on head injuries; on visceral injuries of the chest and abdomen; on operative exposures; on fractures in children; and on spinal injuries. Some of the material on avascular necrosis, reactions of bone to metal, myositis ossificans and the organisation of accident services has been either discarded or incorporated as sections in other chapters. Throughout, the

emphasis has been placed on providing a comprehensive working textbook for use in the accident department or fracture ward. To achieve this end a degree of dogmatism and personal preference about treatment is inevitable. The outstanding popularity of the book in the past has been largely due to the firm guidance it gave about the management of practically every fracture and joint injury. It is hoped that this fundamental principle has been maintained in the new edition.

Some of the material, such as the details of plaster technique, may seem too elementary for a book of this type, but it must be remembered that its distribution is world-wide and that it is used in places where manufactured plaster bandages may be unobtainable and the skills of making efficient home-made bandages have to be learnt anew. In these days when open reduction and internal fixation are so popular the younger surgeons may never learn the technique of using external splintage properly. The Thomas splint is still the most valuable device in the treatment of femoral and knee fractures; and well-applied plaster is still the safest method of fixation of a fracture of the tibia or the forearm. Yet many of our young men have very little knowledge of how to apply a Thomas splint; and even worse—they are quite unable to apply an efficient plaster. These skills form the backbone of fracture treatment and must never be neglected in teaching it.

I am deeply grateful to those authors who have taken on the revision of individual chapters, and in some instances have contributed entirely new material. Their names appear alongside the chapter for which they are responsible and in the list of contributors. But there are many others who have advised on my own manuscript and have made helpful alterations. In particular I would like to thank Dr T. C. B. Stamp, Consultant Physician in charge of the Metabolic Unit of the Royal National Orthopaedic Hospital and Senior Lecturer in the Institute of Orthopaedics, for his advice on the section on metabolic bone disorders in Chapter 33 on pathological fractures; and also Dr Ronald Murray, Director of the Radiology Department at the Royal National Orthopaedic Hospital and Senior Lecturer in the Institute of Orthopaedics, for allowing me to use X-rays from the hospital's radiological museum and for his helpful encouragement. To Lady Watson-Jones I owe a special debt of gratitude for all the hard work of typing the manuscript, of sorting out the original material, and of helping in so many ways to make this revision possible. Many thanks are also due to Mr R. J. Whitley and Mr John Collins of the Photographic Department of the Institute of Orthopaedics who have been very helpful in producing the photographic illustrations; to Mr Frank Price, whose skill as an artist has transformed even the roughest of sketches; to Mr R. F. Ruddick of the London Hospital, who was responsible for preparing the photographs used in the chapter on operative exposures; to Mr C. Davenport, the librarian at the Institute of Orthopaedics, whose knowledge of orthopaedic references has been invaluable; and to my secretary, Miss

Doreen Fox, who has gallantly coped with most of the correspondence and some of the typing in addition to her routine work. Members of the staff of Churchill Livingstone have been remarkably tolerant with a raw editor and I am deeply grateful to them for their forbearance.

But as always it is the author's family who suffer most from the side effects of writing a book. How mine have tolerated them I shall never know. But despite the long time that it has taken they have never given up hope that one day the book would be completed. To my wife, Pat, I can only say—thank you; for the innumerable cups of tea, brought often in the early hours of the morning; for putting up with the conversion of a small cottage into an office—and sometimes a factory; for checking endless references; and for constant encouragement when so often the task seemed too great. Without her help this revision would never have been completed.

1976 J. N. WILSON

Contributors Volume I

M. A. BIRNSTINGL, M.S., F.R.C.S. Consultant Surgeon, St. Bartholomew's Hospital, London; Surgeon (Peripheral Vascular Diseases), Royal National Orthopaedic Hospital, London

D. M. BROOKS, M.A., F.R.C.S. Consultant Orthopaedic Surgeon, University College Hospital, London, Heritage School and Hospital, Chailey, and Royal National Orthopaedic Hospital, London

A. CATTERALL, M.Chir., F.R.C.S. Consultant Orthopaedic Surgeon, Royal National Orthopaedic Hospital, London, and Charing Cross Hospital Group

LIPMANN KESSEL, M.B.E., M.C., F.R.C.S. Director of Clinical Studies, Institute of Orthopaedics, University of London; Consultant Orthopaedic Surgeon, Royal National Orthopaedic Hospital, London

WALPOLE LEWIN, M.A., M.S., F.R.C.S. Consultant Neurological Surgeon, Addenbrooke's Hospital, Cambridge

R. SHACKMAN, F.R.C.S. Emeritus Professor of Urology, University of London; formerly Urologist and Consultant Surgeon, Hammersmith Hospital, London

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1 Healing of Injury

'Wounds should be drest and heal'd, not vext or left wide open to the anguish of the patient.' These are the sixteenth century words of a surgical contemporary of William Shakespeare who himself wrote in Richard III of wounds which if left unprotected 'open their congeal'd mouthes and bleed afresh'.

And so it is with fractures, which are no more than wounds of bone; if not protected, they too bleed afresh. Bone is a vital and pulsating tissue to be dealt with as gently as any other living part of the body. One must forget the white polished bones examined youthfully in Anatomy rooms; that is not bone but skeletal remnants of the dead.

Bone lives. It regenerates day by day. The bone of today is not that of yesterday, nor will it be that of tomorrow. Every hour and every day bone grows and remodels and lives again.

It is evident that the surgeon dealing with fractures must be a physiologist and clinician more than a carpenter and engineer. Fracture union depends upon the same principles of healing which apply to all tissue wounds. It is useful, therefore, to examine these principles before passing on to the more complex detail of fracture repair.

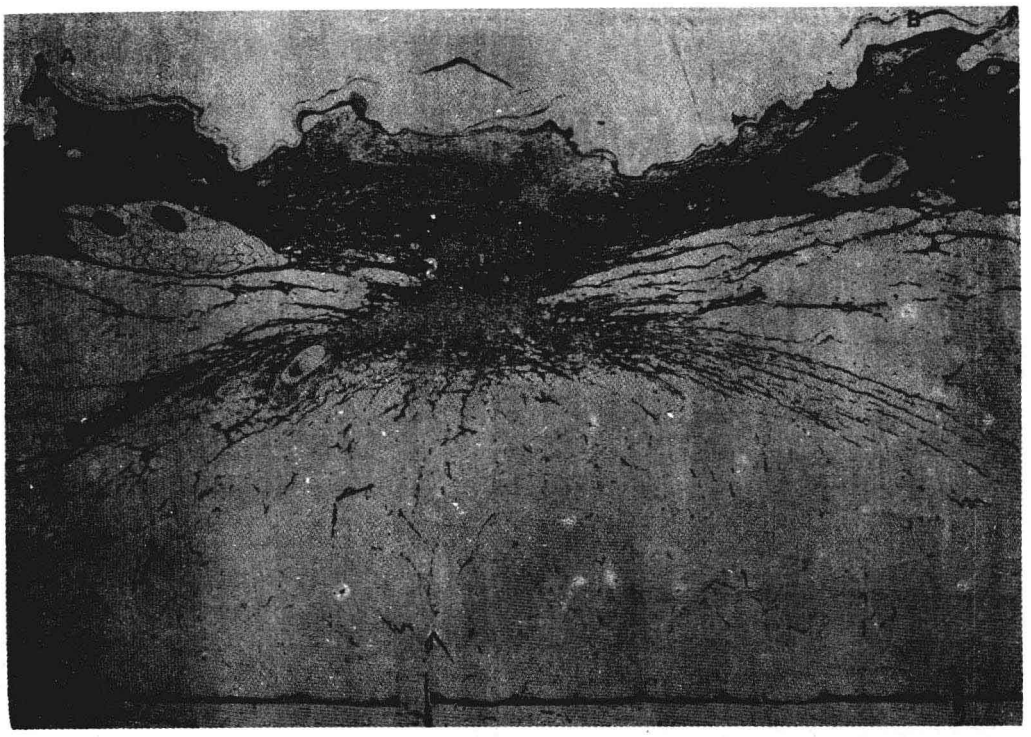

FIG 1.1 Cross-section through a wound of the skin of a pig at 33 days from incision. The extent of the original defect lies between A and B. The fibrous tissue at C has contracted and is drawing in the skin edges. (Reproduced by the kind permission of Dr G. Winter, Department of Biomedical Engineering, Institute of Orthopaedics, Stanmore.)

PRINCIPLES OF WOUND HEALING

Wounds heal best if there is reasonable apposition of the damaged surfaces, sufficient protection to prevent them from tearing apart, a good supply of blood to each side of the wound, and without the complication of infection.

Figure 1.1 shows the healing of an experimental wound of skin in which there was wide separation between the wound edges. Fibroblasts have grown into the haematoma and have formed a central mass of fibrous scar tissue. The contraction of this scar is very well demonstrated, showing how, by this action, the defect in the skin is diminished.

The amount of scar tissue formed will clearly vary with the size of the defect—the wider the gap the larger the scar. Any factor which delays natural healing, particularly for example infection, increases the formation of fibrous tissue: furthermore the scar tissue formed in a skin wound varies from one individual to another—from some unknown constitutional factor. We are all familiar with the ugly keloid scars which can occur in some patients no matter what care is taken in careful suturing; and in certain cases, particularly in coloured races, this excessive scar formation can assume gigantic proportions (Fig 1.2). We have, therefore, the two contrasts of wound healing: the narrow wound, with minimal loss of substance, healing without infection,

FIG 1.2 An extreme example of keloid formation following burns. (The patient was originally under the care of Dr Bahl, City Hospital, Kano, Northern Nigeria.)

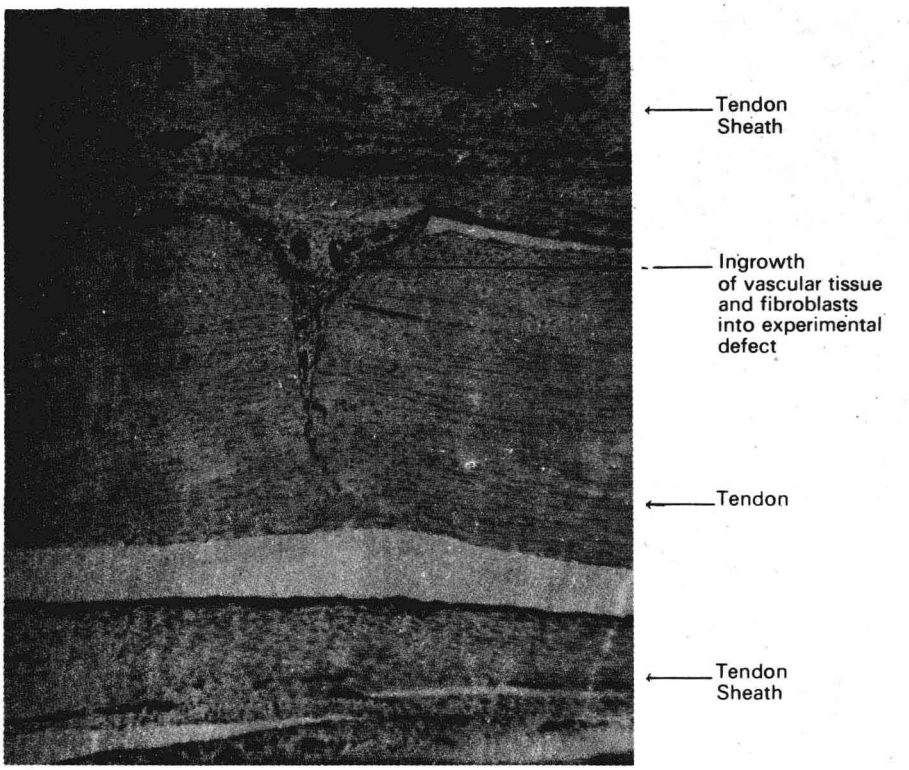

FIG 1.3 Histological section of healing tendon in a dog. Note the ingrowth of vascular tissue and fibroblasts into the defect and the clear formation of adhesions with the tendon sheath. (Sections reproduced by the kind permission of Mr M. S. Brett of Salisbury.)

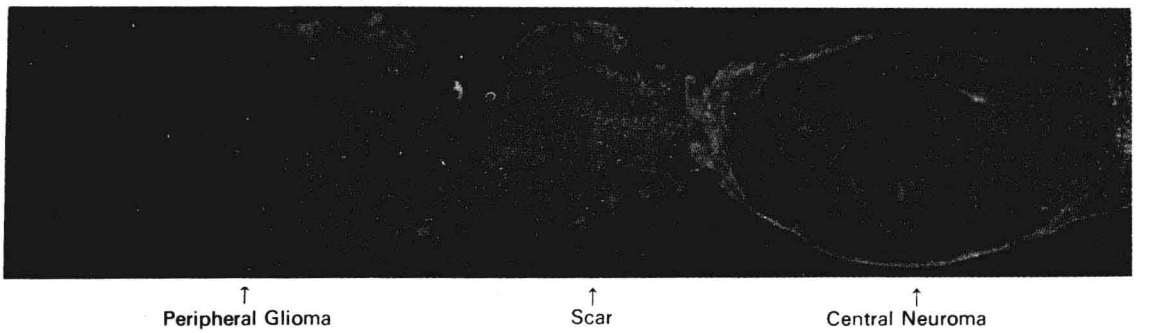

FIG 1.4 Longitudinal section of a nerve removed at operation and showing attempted repair. Although the nerve ends are held together, the gross scar tissue between the cut ends obstructs completely the proximal nerve fibres reaching the distal stump and reparative growth is wasted in the formation of a central neuroma. (Reproduced by kind permission of Sir Herbert Seddon from a microphotograph by Dr J. Z. Young.)

FIG 1.5 This 16-year-old girl was run over by a bus. She sustained a closed fracture of the shaft of the femur with circumferential skin loss due to pressure necrosis.

and uncomplicated by keloid, which forms a scar that is scarcely detectable—so called healing by primary intention: and the wound with traumatized margins, loss of skin substance and infection of the tissue, which will heal by forming large amounts of fibrous tissue and hence a broad, clearly visible scar—healing by secondary intention.

Apart from its cosmetic effect and possible contracture when associated with a joint, excessive scar tissue in a skin wound produces no functional disability. This is not the case however in the healing of more specialised tissues. Figure 1.3 shows the healing reaction of an experimental wound in the tendon of a dog. Here it will be

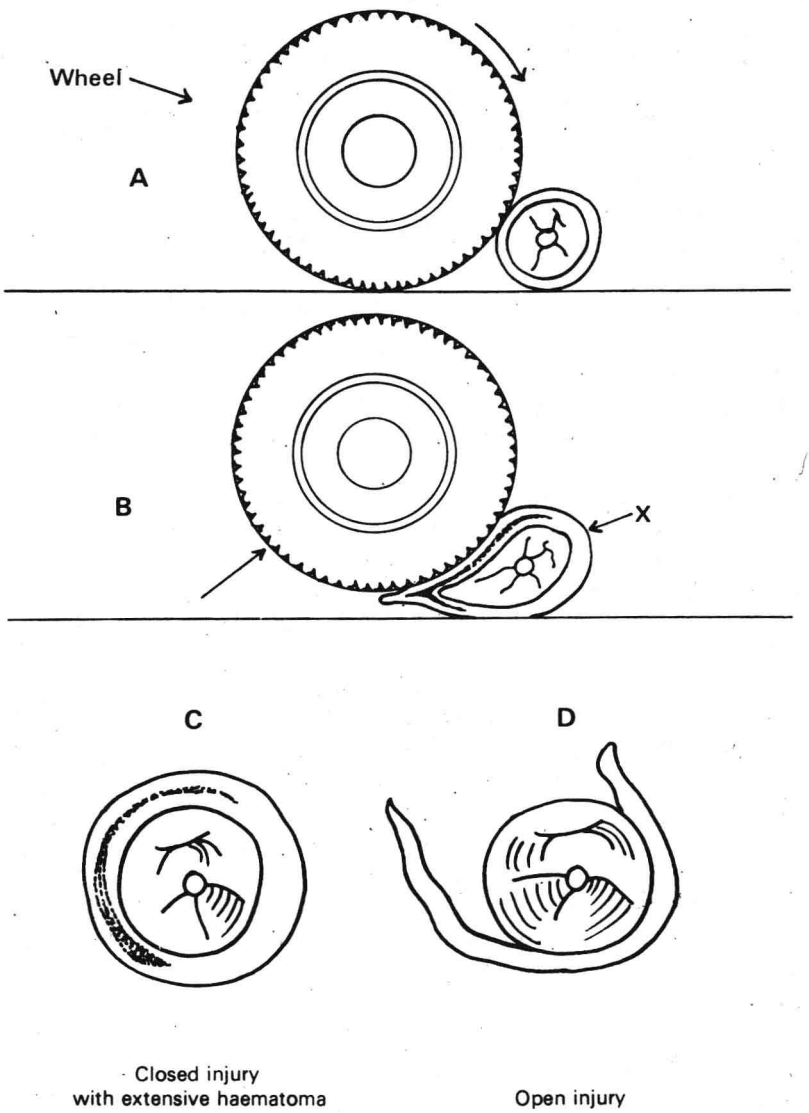

FIG 1.6 The mechanism of degloving injury—producing crushing necrosis of the skin such as shown in Figure 1.5. (Reproduced by kind permission of the *British Medical Journal* and of C. C. Slack, from his article (1952) Friction injuries after road accidents. *British Medical Journal*, ii, 262.)

seen that reparative scar tissue is no respecter of tissue planes and already adhesions are forming between the tendon and its sheath, with inevitable loss of function. Even accurate suturing cannot prevent this disastrous sequence of events. Figure 1.4 shows a section through the site of a nerve injury in which there has been excessive scar tissue formation between the nerve endings. Such a scar will completely obstruct