Manual of Internal Fixation in Small Animals

Edited by
W.O.Brinker R.B.Hohn W.D.Prieur

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Foreword

It is a source of great satisfaction to us that the veterinary arm of the Association for the Study of the Problems of Internal Fixation (AO/ASIF), dedicated to the scientific study of the influence of osteosynthesis on the biology of fracture healing, has published the *Manual of Internal Fixation in Small Animals*.

In many ways this reflects the evolution of the "human" literature, in which the textbook on the use of the large, or standard, armamentarium came first, followed by the volume on "small-bone" instrumentation and techniques.

The biological processes of mammalian fracture repair, whether "natural" or modified by surgery, were indeed the scientific model for much of the research that provided the basis for the development of the AO/ASIF system in man. It is surely fitting that those very animals from which this information was gleaned should now profit.

The cycle is now complete: The benefits of rigid fracture stability permitting immediate function rehabilitation, built upon a firm scientific bedrock and achieved through the precision of technique so well set out in this manual, may now be widely offered to those "passive pioneers" so richly deserving of them.

Fall, 1983

M.E. Müller
M. Allgöwer
R. Schneider
H. Willenegger

Foreword

Before 1937, the treatment of fractures in small animals was confined mainly to casts and splints. Between this period and the mid-1960s, fixation by Stader and Kirschner-Ehmer splints, bone sutures, and occasional Sherman or Lane bone plates was added to the veterinary armamentarium. The functional and anatomical results were less than desirable in many cases, and nonunion, malunion, and stiff joints were not uncommon. This mirrored the state of the art of internal fixation of fractures in man at the time.

Fracture treatment, however, took a tremendous leap forward in 1958 when the Swiss Association for the Study of Internal Fixation (AO/ASIF) defined the biomechanical principles for successful internal fixation of fractures, and implemented these principles with the creation of an entire system of stainless steel implants and instruments. Their applied fracture research was carried out in the Laboratory for Experimental Surgery in Davos, Switzerland, based on metallurgical expertise gleaned from the watch industry and expert European toolmakers.

Documentation in Bern of more than 100,000 clinical cases using these AO/ASIF methods and based on a comprehensive classification of fractures confirmed the reliability and quality of the system. The central theme was the rapid return of function after fracture treatment. This was accomplished by anatomical reduction, stable internal fixation with implants utilizing interfragmentary compression, buttressing, medullary splintage, and preservation or enhancement of the fracture blood supply by early exercise and early bone grafting. There was usually no necessity for casts or external splintage. Emphasis was also placed on preoperative planning, operative asepsis, gentle soft-tissue handling and atraumatic exposure of the fractured bone, and early postoperative mobilization of the part and the patient. Protected weight-bearing and careful radiographic monitoring until union was achieved completed the regime.

The bridge between human and veterinary fracture treatment and indeed orthopedics began to be built early in the 1940s by Küntscher with his experimental work on intramedullary nailing in dogs. Dr. Jacques Jenny, as a resident in Zurich in 1943, assisted Dr. H. Knoll and Dr. H. Willenegger with the first clinical canine femoral intramedullary nailing. This launched his outstanding orthopedic career. In 1965, after Dr. Jenny, Dr. R. Bruce Hohn, and I met, these men initiated AO/ASIF techniques in small animals at the University of Pennsylvania and the Animal Medical Center in New York, respectively, utilizing human AO/ASIF principles and instrumentation.

Following participation in 1969 in a human AO/ASIF course in Davos, Drs. Hohn, Jenny, Brinker, Prieur, von Salis, Piermattei, Kasa, Hauser, H. Butler, and others developed courses for veterinarians, at Bettlach and Davos in Switzerland, and at Ohio State University in Columbus, Ohio in the United States.

Veterinary AO/ASIF sections were started in these two countries with the special help of Dr. Fritz Straumann, and were united as an international organization in 1970. Teaching of the AO/ASIF system is now worldwide. Basic and advanced courses have been held regularly in Switzerland, the United States, and other countries.

Research led to the design of new implants which would conform to the anatomical osseous variations and functional requirements of animals, and to the definition of techniques specific for the various animal species. The original AO/ASIF principles have proven to be as successful in large and small animals as in humans. This has been clearly demonstrated by analysis of the documentation of the treatment and follow-up of thousands of animal fractures. The authors have drawn on their vast clinical experience and on this documentation to present this manual on internal fixation as a consensus of successful techniques for treating the numerous canine fractures. The manual gives precise "cookbook" illustrations and explanations of the internal fixation of the different fracture types occurring in each bone.

In order to obtain the same high-quality results from the methods promulgated in this book, the reader must obtain specialized practical training at a course or school, and practice the exacting techniques on cadavers or plastic bones; otherwise, the method becomes a double-edged sword and the race between functional fracture healing and implant failure will be lost. This is also true if aseptic operating conditions are not available and sepsis ensues, if proper size, type, and length of implants are not used and appliance failure occurs, or if blood supply to bone is compromised by a traumatic operative procedure prolonging healing time and making nonunion a certainty.

We express our sincere thanks to all who took part in producing this manual: to the editors W.O. Brinker, R.B. Hohn, and W.D. Prieur for their untiring effort in collating, organizing, and integrating the text, diagrams, and radiographs; to the authors; to our publishers; and to the marvellous artists, Georgio Bertoli and his associates Bernhard Struchen and Andreas Farner, whose plates not only present the material graphically and concisely, but are indeed works of art.

In conclusion, I wish the best of luck to all the practitioners and students who use this manual to obtain optimum functional results in the treatment of small-animal fractures with the internal fixation methods described herein.

Fall, 1983 Howard Rosen

Preface

In 1958 a study group of surgeons in Switzerland formed the *Arbeitsgemeinschaft für Osteosynthesefragen* (AO), known later in North America as the Association for the Study of Internal Fixation (ASIF). The members of this AO/ASIF group studied the then current methods and instrumentation of internal fixation of fractures in human patients, and joined with bioengineers, manufacturers, and basic research specialists to develop new internal fixation devices and techniques of fracture treatment. Through educational courses, now international, they promoted the concept of fracture management through accurate anatomical reconstruction, rigid stabilization, primary bone healing, and prevention of fracture disease through early postoperative weight-bearing.

For best results in treating fractures in animals, the patient should be ambulant shortly after recovering from anesthesia and should have an early return to full function. Until the introduction of the AO/ASIF system to veterinary medicine in the mid-1960s, this goal was unattainable in many cases, particularly in the treatment of complex fractures.

After becoming familiar with the AO/ASIF studies on bone biology, biomechanics, and the metallurgy of internal fixation and their documented results from numerous clinical cases in man, it became obvious that application of the same principles and equipment in veterinary bone and joint surgery would help resolve many of the problems and shortcomings encountered with several existing methods of fracture fixation. We are very grateful to the AO/ASIF group.

Veterinarians have adapted the AO/ASIF principles for internal fixation of fractures, made some modifications better suited to the needs of animals, carried out orthopedic research, developed some new and more versatile equipment, and carefully documented the initial treatment and follow-up results in numerous fracture cases.

The first part of this manual deals with the principles of the AO/ASIF method of stable internal fixation. It covers both the experimental and theoretical aspects, including function and main use of the different implants, use of the different AO/ASIF instruments, operative technique, pre- and postoperative evaluation and care, metallurgy, and postoperative complications.

The second part deals with the AO/ASIF recommendations for the operative treatment of the most common fresh fractures occurring in the various locations in the adult and growing animal.

The third part presents reconstructive bone surgery using stable internal fixation.

This manual is designed to convey to the student and the veterinary surgeon the basic knowledge and techniques of small-animal fracture treatment. The information and procedures presented are those which documentation studies

on clinical cases indicate as the most appropriate at this time. Note that we are recommending this as a system of internal fixation of fractures, not as a complete substitute for all fracture treatment. The importance of training, individual study, short courses, documentation, etc. cannot be overemphasized. We wish to express sincere thanks to all who took part in producing this manual, particularly our wonderful artists Georgio Bertoli, Bernhard Struchen, and Andreas Farner.

Fall, 1983

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R.B. Hohn
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Table of Contents

Part I

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