Flexible Intramedullary Nailing in Children
At last, a book dedicated to ESIN (elastic stable intramedullary nailing for those rare people who would not yet know what this acronym means)!

Today, ESIN ranks as high as conservative treatment in pediatric traumatology. One may be surprised at the paucity of published material about such a widely used surgical technique. Since my book was released in 1984, many articles have been published in specialized periodicals, but very few works have been written on this specific topic. The technique itself is so simple that very few improvements have been needed, but the indications have significantly expanded. The extensive experience of all the surgical teams who have contributed to this book should help bring down a complication rate that is already very low.

Up to 1977, no therapeutic alternative was available for fractures that required accurate reduction or for which immobilization was not desirable. The potential risk of dreadful complications using stiff internal fixation systems developed for adult patients outweighed the risk of malunion associated with inadequate closed reduction.

And yet, at that time, answers had already been found. The development of ESIN consisted in adapting to pediatric needs ideas that had limited acceptance and no clinical application:

- Flexible internal fixation allowing for micromotions at the fracture site enhances development of callus.
- Preservation of periosteum and fracture hematoma is critical to callus formation.

Elastic nailing addresses the conflicting situation of having a very stiff device implanted in elastic bone tissue. Percutaneous insertion does not affect the environment of the fracture, and healing conditions are very similar to those of conservative treatment.

During the first few years, from 1977 through 1980, this technique was reserved for specific indications such as patients with multiple injuries or severe head trauma in whom cast immobilization or traction was impracticable.

As the quality of the results achieved in the Department of Pediatric Orthopaedics (headed by Prof. Prévot), University Hospital, Nancy (France) gradually improved in spite of difficult intra- and postoperative conditions, surgical indications for ESIN expanded. Later on, many surgical teams, French teams first and then foreign teams became interested in this method. Today, ESIN is considered as the “Gold Standard” in surgical treatment of pediatric fractures by most pediatric orthopedic surgeons around the world. As surgeons now have higher requirements with respect to
anatomic outcome, ESIN indications have markedly expanded. Furthermore, patient comfort, which was not a top priority 30 years ago, is now taken into consideration. Additional factors such as the overall cost of treatment and the impact of treatment on school attendance and family life are also taken into account. Thus, after being regarded as “the best alternative for patients who did not respond favorably to conservative treatment,” this safe, highly effective technique has been increasingly used with patient benefit as a key element: rapid healing, better comfort, and minimal disturbance of life. Paradoxically, one of the main issues with ESIN is its apparent simplicity and the excellent patient tolerance of the device. ESIN mechanical principles are easy to understand and the technique itself looks rather straightforward. As a result, many surgeons think that they are perfectly able to perform ESIN procedures with just a basic knowledge of its main principles and without any specific training. This inevitably leads to a number of complications, which are of course readily attributed to the method, whereas they are only the result of insufficient training and lack of experience. Curiously, some awkward constructs often yield a successful outcome. This does not mean that one can do anything and that it is just a matter of placing two nails, not bothering about diameter, length, entry point or position of the nails. Poor results are consistently due to incorrect constructs or indications.

We wanted this book to be an educational tool with lots of figures to illustrate all the indications (and contraindications) of ESIN, delivering hints and tips and emphasizing pitfalls to assist surgeons in achieving an optimal construct for each type of fracture. Each chapter includes detailed information about all the complications that may occur, even if infrequent, which is extremely important as it is much easier to avoid pitfalls that are already known. Careful reading of the complications experienced by experts of this technique will hopefully spare ESIN users and their patients many problems and disappointments.

It is a pleasure and honor to write the preface to a book that fills a significant gap in the literature on pediatric traumatology, and is doomed to become a mandatory reference work in traumatology, which every library will want to have on its shelves.

Jean-Paul Métaizeau
Those of us in the English-speaking communities of pediatric orthopedics should now be excited that the pioneering work of the French-speaking originators of flexible intramedullary nailing (FIN) or elastic stable intramedullary nailing (ESIN) has been made available in this English translation of the original French textbook. The real beauty of this textbook is to learn the basic concepts and specific techniques of FIN that were originally pioneered by Jean-Paul Métaizeau. His work has been continued by Pierre Lascombes and his present co-workers who have labored hard to collect and organize the principles and techniques of FIN into this valuable textbook.

The use of the FIN has been one of the major advances in the management of long bone fractures in the skeletally immature individual. It has revolutionized the manner in which these injuries are now treated. I was a part of that generation of orthopedic surgeons who, in the past, treated children with fractures of the femoral shaft with skeletal and skin traction requiring weeks of hospitalization. The ability now to be able to mobilize children with femoral shaft fractures within a few days of the injury has been a tremendous source of pleasure in my present management of these injuries. This ability to rapidly mobilize the extremities containing long bone fractures has been a blessing for the parents and patients, as well as the treating surgeons.

This textbook is extremely reader friendly. The individual chapters are clear and concise. The text is broken up into many small paragraphs with frequent subtitles that make it easy to speed read, a technique that most surgeons utilize when reviewing textbooks.

The reader will discover that this book contains a wealth of information. Needless to say, the most important sections are those chapters in the final part of the book, which deal with the various FIN techniques for each of the fracture types. However, in the initial part of this textbook, the reader is first exposed to the basic principles and other ancillary processes that are necessary for the successful management of these fractures utilizing FIN. The important concepts regarding the basic science, experimental studies, and biomechanics of FIN are outlined in great detail in the introductory chapters. There are some unique chapters that deal with subjects not found elsewhere in the pediatric fracture literature, such as the differences between the use of titanium and stainless steel implants, imaging techniques with an emphasis on minimizing exposure to both the patient and surgeon, and finally, a chapter dedicated to the protocol of informing the parents on how to deal with their child in both the preoperative and postoperative periods. Thus, the reader will have the ability to become well-grounded on the basic concepts necessary to achieve a successful outcome prior to applying the specific techniques of the individual fracture patterns.
The final chapters, which deal with the specific techniques of managing the various types of long bone fractures in the skeletally immature patient, are again extremely complete and well organized. In each of the chapters, there is first a review of the characteristics of the fracture type being discussed. This is then followed by a very complete discussion of the specific FIN technique utilized. There is a complete discussion of topics involved in the preoperative management such as positioning, surgical approaches, and selection of the implants. The specific surgical techniques are very well described with extremely clear illustrations. Many of the discussions of the specific surgical techniques contain little pearls that often disclose how to facilitate a reduction or improve the stability of the fracture immobilization. The discussions on complications are well organized into early, late, and those associated with the technique itself. At the end of each of the chapters dealing with the most common fracture types managed by the FIN technique, there are sample case reports. These are followed by three tables that summarize the material contained in the chapter:

1. The six key points in the treatment process.
2. A protocol for the postoperative management.
3. The suggested indications for the use of the FIN techniques for the specific fracture discussed in the chapter.

It is predicted that in the future this textbook will become a required reading for all those individuals undergoing postgraduate training in orthopedic surgery. In addition, this textbook will serve to upgrade those of us who have been treating our patients in the past with the FIN techniques without the benefit of all this valuable information.

Kaye Wilkins
Preface

For many decades up to the late 1960’s, the treatment of the diaphyseal and metaphyseal fractures in children was exclusively conservative. At that time, the only significant textbook on children’s fractures was that of Walter Blount, which was published in 1955. The ensuing development of surgical fracture treatment using plates and locking nails produced no real benefit in the treatment of fractures in growing bones.

In the late 1970’s at the Nancy University Hospital - situated in the North East of France and serving a population of 2.5 million people - Jean-Paul Métaizeau, M.D. and Jean-Noël Ligier, M.D. developed the concept of flexible intramedullary nailing (FIN). The method, previously used in Seville Spain, is based on the use of two curved intramedullary nails introduced into the injured bone through the metaphyseal area far from the fracture itself as well from the physis. This mini invasive surgery obtained an excellent boney union while respecting the periosteal callus. The stability was adequate enough to avoid postoperative immobilization. A rapid rehabilitation was possible, which resulted in a shortened hospital stay and a rapid return to the stable environment of home, family, school and hobbies. This combination of physical and psychological benefits for a traumatized child otherwise encountering an unnecessary pause in his or her natural development was further complimented by the economical benefit to the hospitals, families and insurers.

Professor Jean Prévot and I then spread our large experience with the FIN procedure from the Nancy University Hospital to all of France and then throughout Europe. The success was immediate with a lot of excellent results. In North America, Dr G. Dean Mac Even was one of the first surgeons to note the advantages of this method. However, some complications were described mainly due to an insufficient comprehension of the method and to significant modifications of the original technique. We realized that more information was mandatory, specifically in each detail of the procedure such as choice of the frame, selection of the nails according to their diameter and their shape, surgical approach, reduction of the fracture, orientation of the nails, impaction of the nails and the fracture, end of the surgical procedure and postoperative treatment.

At the beginning of this new century, Professor Remy Kohler of Lyon, France pushed me to write the FIN technique. The French edition, published in 2006 by Elsevier France, contained the data of more than 25 years of experience, and of more than 2,000 FIN procedures in our Department of Pediatric Orthopedics in the Nancy University Hospital. The great number of technical drawings, X rays and clinical cases allowed surgeons a more precise understanding of the technique and the strategy. A large part was dedicated to complications and how to avoid them.
Colleagues from North America, notably Dr. Kaye Wilkins of San Antonio, insisted that the information contained in the book should be made available to Anglophone surgeons as well. I wish to pay homage to Thomas Roumens and Mary Kenny who initiated this English edition entitled: FIN, the Nancy University Manual. With this translated and improved edition, my sincere wish is to make the indications and the technique of the FIN procedure as comprehensive as possible so as to contribute to excellent fracture care of our children.

Nancy, France

Professor Pierre Lascombes, M.D.
I thank a number of people who have helped in the realization of this book:

- Jocelyne Dieng for the translation from French to English
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- Thomas Roumens, without whom the realization of this book could not have been achieved

“Just as the stays support the mast of a sailboat, so do the muscle masses support the skeletal frame.”
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