Atlas of Craniomaxillofacial Surgery

JACKSON
MUNRO
SALYER
WHITAKER

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IAN T. JACKSON, M.B., F.R.C.S.

Professor in Plastic Surgery, Mayo Medical School, University of Minnesota;
Consultant in Plastic Surgery, Mayo Clinic, Rochester, Minnesota

IAN R. MUNRO, M.B., F.R.C.S.(C.)

Associate Professor of Surgery, University of Toronto;
Staff Surgeon for The Hospital for Sick Children;
Staff Surgeon for Sunnybrook Medical Center;
Toronto, Ontario, Canada

KENNETH E. SALYER, M.D., F.A.C.S.

Director of Craniofacial Surgery and Attending Plastic Surgeon,
Baylor University Medical Center and Children's Medical Center, Dallas, Texas

LINTON A. WHITAKER, M.D., F.A.C.S.

Director, Craniofacial Program, and Professor of Surgery (Plastic),
University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

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William Winn *and* **Scott Barrows,** *Illustrators*

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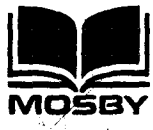

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FERNANDO ORTIZ-MONASTERIO, M.D.

Professor of Plastic Surgery, Hospital General "Dr. Manuel Gea Gonzalez"; Graduate Division of the Medical School, Universidad Nacional Autonoma de Mexico, Mexico City, Mexico

DANIEL MARCHAC, M.D.

Ancien Interne des Hôpitaux de Paris, Ancien Chef de Clinique à la Faculté, Chirurgien Attaché de L'Hôpital St. Louis, Paris, France

MICHAEL A. E. RAMSAY, M.D., F.F.A.R.C.S.

Attending Anesthesiologist, Baylor University Medical Center, Dallas, Texas

DAVID W. DAVIES, M.B., Ch.B., F.R.C.P.(C.)

Assistant Professor, Department of Anesthesia, The Hospital for Sick Children, Toronto, Ontario, Canada

ROBIN HUMPHREYS, M.D., F.R.C.S.(C.)

Associate Professor, Division of Neurosurgery, Department of Surgery, The Hospital for Sick Children, Toronto, Ontario, Canada

R. BRUCE ROSS, D.D.S., Dip. Orth., M.S.(Dent.), F.R.C.D.(C.)

Dentist-in-Chief, The Hospital for Sick Children, Toronto, Ontario, Canada

ALEX M. WRIGHT, B.Sc.

Director, Department of Visual Education, The Hospital for Sick Children, Toronto, Ontario, Canada

WILLIAM M. WINN, M.S.

Vice-President, Jones, Pointer, Winn, Inc., Dallas, Texas

SCOTT BARROWS, B.S.

Instructor and Medical Illustrator, Department of Biomedical Communications, University of Texas Health Sciences Center at Dallas, Dallas, Texas

Acknowledgments

LEWIS E. CALVER, M.S.

Assistant Professor, Biomedical Communications, Department of Biomedical Communications, University of Texas Health Sciences Center at Dallas, Dallas, Texas

STEVEN J. HARRISON, M.S.

Medical Illustrator, Arizona Heart Institute, Phoenix, Arizona

NOTES ON THE HISTORY OF CRANIOFACIAL SURGERY

Historical research shows the difficulties in isolating individual contributions and inventions. Historians of science are asking new questions. Instead of looking for evolution of older ideas to our present knowledge, they are trying to grasp the historical integrity of science in its own time.

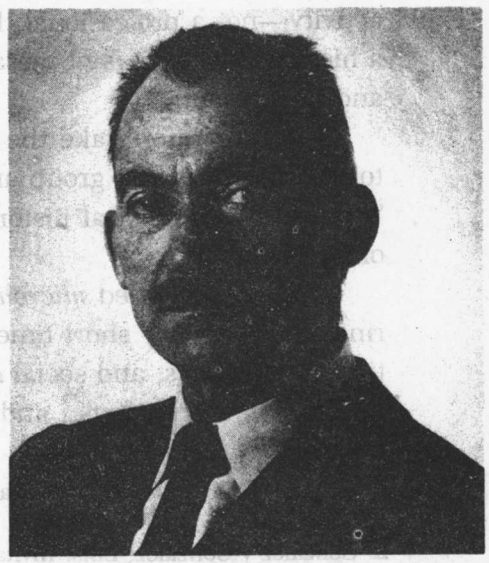
Rather than searching for the relationship of the thinking of Virchow with our modern medicine, they ask about the relation between our views and those of his contemporaries, colleagues, disciples, teachers. The opinion of the group regarding a particular scientific advancement, expressed at the time, is important for the overall comprehension of the phenomenon.

Profoundly aware of this historiographic revolution, we must carefully record the progress in our own field of science.

All scientific advancement changes the prevailing dogmas. A breakthrough is created, offering unsuspected possibilities for questioning, exploring, and experimenting. Once the phenomenon reaches its ultimate repercussions, when the scientific community has accepted the new dogma, the original field of knowledge has been extended. The frontiers have been pushed farther, and the territorial limits must be defined once more.

The development of craniofacial surgery originated by Paul Tessier offered unlimited possibilities for the correction of monstrous deformities previously considered inoperable and captured the attention of surgeons from all over the world. No comparable advancement had been made in surgical technique since the beginning of open heart surgery.

Plastic surgeons, astonished, watched how the narrow limits of maxillofacial surgery were extended into the orbit and the cranium. It became necessary for those particularly



Paul Tessier

interested in this aspect of facial reconstruction to make the pilgrimage to the Hospital Foch in Suresnes near Paris to observe the Master performing his fantastic operations that, from a distance, appeared difficult to understand.

The advances of craniofacial surgery are now well known. It is possible to follow step by step in the medical literature of the last two decades all the ideas, innovations, and technical refinements that have formed this new surgical subspecialty. Many authors have contributed to the development of this new field. Some, before Tessier, expressed concepts that he used as a starting point. Others, almost simultaneously, explored part of the road, and many more, inspired by his ideas, have later made important contributions. The role of each one in the history of craniofacial surgery will be properly evaluated in the future. It is impossible with limited space even to enumerate in chronologic sequence and with critical sense all the reports. I don't even dare mention the names of the authors, fearing to make involuntary mistakes of omission or judgment.

My purpose here is to present some information about the work of Paul Tessier not previously published. We know when his first craniofacial disjunction was presented, but we ask ourselves: How did he design this first operation? What steps did he follow to plan the procedure? Were there any preliminary trials? Did he question the indications?

We now clearly understand the transoperative problems and the participation of the neurosurgeon in the team, but we are curious to know more about the difficulties and doubts found in the first cases and how Paul managed to enroll his colleagues of other specialties.

History is a discipline far removed from my field. It requires rigorous technical training that I do not possess. My interest in history is that of an amateur in the literal sense of the word: a person who is in love with an activity—not a professional. I am frightened to think that in order to pursue a historical study it is necessary to follow a system of operations on heuristics and hermeneutics.

I will therefore take the role of the chronicler, whose interest is limited to the history of the group and the community, accepting with Leuillot that "the principles of local history are different from and even opposed to those of general history."[1]

This genre called *microhistory*[2] records the information of events occurring in a relatively short time. As opposed to general history that studies nations, tendencies, and social changes, microhistory limits itself to a narrower geographic, chronologic, and human space. The term *petit histoire*, coined

1. Leuillot, Paul: Défense et illustration de l'histoire locale. Annales, Colia. January, 1967, p. 155.
2. Gonzalez y Gonzalez, Luis: Invitation a la microhistoria. Sep. Setentas, 1973, México.

by the French, describes a byproduct of biography with a rather frivolous connotation. I will then keep the word *microhistory* to define the information presented here.

It is difficult for a man passionately involved in his work to find the time to prepare manuscripts for scientific publications. He could hardly find the place and much less the motivation to write the chronicle of his own activities. The natural modesty to evaluate his own work would obstruct any autobiographic attempt.

For all these reasons I proposed to Tessier my idea of making a document about his role in the development of craniofacial surgery that would provide a reference for medical historians in the future. The most practical method, I suggested, was to follow the techniques of oral history and tape-record the interview. It took time to convince Paul. Finally at a memorable lunch in Mexico City and with the help of our mutual friend Jack Mustardé, he expressed his consent. I appreciate that he accepted my role as chronicler. It was made clear from the beginning that my purpose was to do historiography more than history, to produce a document, not a study, because my own participation in this surgery and my personal friendship with Paul would obviously limit an analytic effort.

In the summer of 1977, in Barcelona, Spain, the interview was recorded. Some excerpts of that recording are here transcribed.

■ My background in surgery? I started my medical studies in Nantes and also began there my training as a surgeon. I went to Paris to specialize and stayed there after the war working in general surgery. My chief was Georges Huc, a great orthopedist at the Hospital Saint Joseph who was interested in malformations in children, including those in the face. He had a great influence on me.

■ Since 1946, while working in Saint Joseph in Paris, I spent 3 or 4 months every year in Britain visiting Gillies, Mowlem, McIndoe, and Barron. It was not like a prolonged stay abroad where my own surgery would be limited. I obtained knowledge that was put to practice immediately.

■ I can't tell you when I became interested in craniofacial surgery because the term itself did not exist at that time.

■ In 1957 I saw a 20-year-old patient who came for consultation accompanied by his mother. His prodigious exorbitism and monstrous aspect did not resemble anything I had seen before. At the end of the examination I was unaware of the name of his disease. When I saw him again 2 months later, I knew he had a Crouzon disease and I had also reached the conclusion that the orbital, maxillary, and facial deformities should be treated simultaneously.

■ I could not foresee that a fracture line was being transformed into a surgical procedure.

■ In retrospect, I think it was good that the first case was so monstrous, because I was forced to search for a radical solution.

■ I didn't think the osteotomy published by Gillies for the treatment of a moderate Crouzon was applicable to my patient. We had to do something different.

■ Of course, I practiced on cadavers. At the beginning I worked on skulls that I had at home, aware that they were different from the skull of my patient but I did not know what the differences were.

■ Afterward I told myself, "Of course I will go with the fellows at the Department of Anatomy in Nantes where I used to work as an assistant professor!"

■ Several times I boarded the evening train in Paris with my instrument nurse and equipment. We arrived in Nantes at eight and then went directly to the morgue where I tried on the cadaver the operation that I was planning to perform to my patient. We took the train after midnight, and by 9 AM we were having breakfast at the Paris station. I realized that the tissues of the preserved cadaver did not yield to mobilization and displacement of the skeleton.

■ Finally I thought I was ready to operate on my first patient.

■ The operation was very difficult, as you can imagine. The facial skeleton in one piece advanced 25 millimeters, losing contact with the cranium.

■ Of course, I had already taken the bone grafts that should fill the spaces.

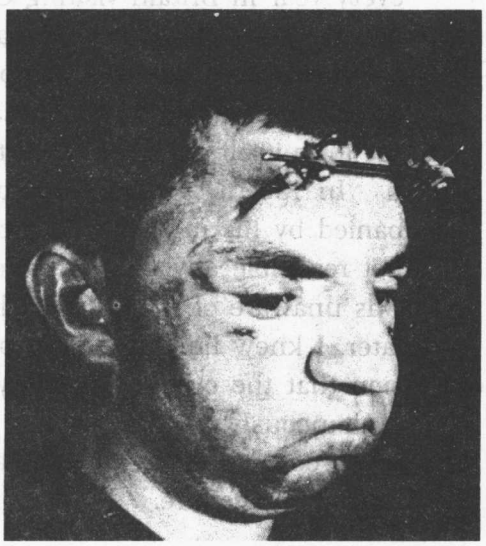
■ But at the beginning of the operation I could not imagine that the bony defects would be so numerous, so big and so irregular in shape.

■ It was not like today when we use the coronal incision. The multiple facial incisions did not give adequate exposure.

■ Instruments were not adequate either, and we produced many small, irregular fractures. The bone grafts did not fit in the defect and the osteosyntheses were not satisfactory.

■ The biggest problem was the fixation of the facial skeleton at the end of the operation. After a few days the face was entirely loose. Meanwhile an external fixation apparatus was made for me at the workshop of Simal. It was put on the patient 2 weeks later, fixing the screws to the temporal crest and zygoma. This first apparatus did not work, and a new one was built that finally could stabilize the face.

■ I did not see a similar case in 3 years.



■ In 1959 or 1960 I did the first Le Fort II osteotomy in a patient with sequelae of cleft lip and palate. At that time a patient with Apert syndrome was referred to me. I decided to wait and see a few more cases.

■ I finally operated on three patients within a few weeks and, shortly after, two or three more with craniostenosis.

■ I became interested in hypertelorism almost simultaneously. My friend Lagache, a surgeon from Lille, showed me a young man with orbital hypertelorism just as monstrous as the first Crouzon.

■ Canthoplasties and other routine procedures could not accomplish anything in a case like this. It was necessary to use an entirely different approach.

■ By that time I had a working relationship with Guiot, neurosurgeon of the Hospital Foch, who had a unique experience in the treatment of orbital meningiomas.

■ With Guiot we usually did immediate reconstruction after the excision of tumors or in trauma cases.

■ I thought it was necessary to remove the tissues between the two orbits and then join the orbits at the center. This could only be done through the intracranial route. Guiot objected to the risks of infection inherent to the aperture of the nasal cavity and the frontal sinus. "But that," I said, "is exactly what you do when you remove the tumors."

■ It was decided to make a preliminary procedure to reinforce the meninges. Guiot made a frontal craniotomy, removed part of the overdeveloped frontal sinus and obliterated the rest of it. I used a dermis graft. I realized at that moment that I was not ready to mobilize the orbits. There were anomalies I did not clearly understand.

■ Did you know that I waited 3 years to operate on the first hypertelorbitism?

■ In 1964 I operated with Guiot on three cases of hypertelorbitism in 3 weeks that went very well. Only then I accepted to operate on the first patient on whom I had used the dermis graft.

■ Yes, I presented my first case in Montepellier in 1967 at the Meeting of the French Society of Plastic Surgery. My communication was very well received, but I did not think I was making an important contribution.

■ At the International Congress in Rome in 1967 many colleagues from other countries were interested in my exhibit. Schmit, Obwegeser, Converse, and many more, with their comments, made me think that I might have something really new.

■ I realized that many surgeons wanted to see that surgery. I then decided to have the first meeting at Foch in December 1967. I personally invited a few distinguished maxillofacial surgeons, ophthalmologists, neurosurgeons,

pediatricians, and plastic surgeons. Altogether some 20 people were present: Schukart, Converse, Petit, Mustardé and many more.

The meeting of Foch lasted a week. I presented all the previously operated cases and did four more surgical procedures—two hypertelorbitisms and two Crouzons.

■ "I invite you," I said, "neurosurgeons, ophthalmologists, and specialists in other disciplines, to be the critics, to express your comments.

■ "If, after watching these four operations, you consider that the surgical risk is too great or that I am compromising the future of the patients; if in spite of the favorable results obtained so far, you believe the procedures are too dangerous, on your word I will stop this surgery!"

■ No, Fernando, you are wrong, I was not sure at all that the visitors would agree with my operations. If men like Hogeman, Guiot, Odin, or Mustardé had said, "This is madness; you cannot continue," I would have stopped immediately.

■ Comments were favorable. "This is unusual surgery and we are not familiar with it," they said. "We have seen impressive maneuvers, some maybe even dangerous, but there is danger involved in any operation. You must, therefore, continue."

Craniofacial surgery had been born officially. It was baptized in the first Meeting at Foch by the representatives of the scientific community. The barriers were down. The breach was open to explore numerous paths, to propose innovation, to refine techniques, to multiply the indications, and finally to establish the general principles of craniofacial surgery and to make them applicable to other facial deformities.

The contribution of Paul Tessier in this second stage of craniofacial surgery has been as brilliant as the first. With tireless energy he has multiplied his surgical experience; he has published classic papers. With unusual generosity he has opened the doors of his operating room and shared his knowledge with scholars from all countries.

Paul remains firmly rooted in the soil of France. He has the Frenchman's quiet strength, his sturdy reliability, his liking for hard logical facts, and his love of good workmanship.

It remains for the historians of the future, with the perspective that can only be achieved with distance, to incorporate the contributions of Tessier into the general history of medicine.

Fernando Ortiz-Monasterio, M.D.

Durango 33
Mexico 7, D.F.

PREFACE

Modern craniomaxillofacial surgery for the correction of major congenital skeletal deformities has been developing over the last 15 years. This atlas has been produced to illustrate in one volume the current techniques that we use. It is not a compendium of all methods available, but just those that we feel are most useful to us. Some of the methods illustrated should be in the armamentarium of all plastic surgeons. The general principles will be of use to all surgeons treating acute or late traumatic deformities. In addition we have illustrated the use of these techniques for the management of certain tumors of the orbital and cranial region.

The correction of traumatically caused facial skeletal deformities by repositioning displaced parts or constructing those parts when absent is not new. The first impetus came from World War I, which produced terrible facial deformities from trench warfare. However, it was not until after World War II that the main concepts for correcting congenital skeletal deformities were developed. Modern craniomaxillofacial surgery is the accumulation of principles developed by many surgeons; however, three people can be considered as having produced the greatest contributions. Sir Harold Gillies spanned the era of development between reconstruction of traumatic deformities and the application of his experience to major congenital deformities. Professor Hugo Obwegeser has had a significant impact on methods for the correction of the lower facial skeleton. Nevertheless, the pioneer of modern craniofacial surgery is Dr. Paul Tessier. He violated many accepted surgical tenets and proved that radical approaches would enable the correction of deformities hitherto impossible to treat. His main principle has been that, when craniofacial deformities are caused by an underlying skeletal defect, the skeleton must either be repositioned or be constructed with autogenous bone grafts. This led him to develop three techniques that had previously been considered impossible. The first was that extensive areas of the craniofacial skeleton could be devascularized completely, repositioned, and still survive. The second was that if the orbital contents were circumferentially mobilized, the eye itself could be moved permanently in any of the three planes of space without affecting vision. Third, he developed the techniques of simultaneous

intracranial and extracranial surgery to enable radical repositioning or construction of the orbits and skull. These three techniques are the foundation upon which modern craniomaxillofacial surgery continues to expand. We are indebted to Dr. Paul Tessier for his willingness to demonstrate and teach this surgery.

Joint authorship has produced this atlas, with individual contributions to each chapter. We have shown where most of the bone cuts should be made, and thus the book can be used as a reference for this. We have not discussed the minutiae of all techniques needed to successfully complete these operations but have emphasized those points that we find significant. Craniomaxillofacial surgery is such a rapidly expanding and now large specialty that we have kept the discussion of principles and methods of application to a minimum in order to curtail the size of the book.

Finally, we have adhered to Dr. Paul Tessier's other principle: that craniofacial surgery should be performed only if it is the main interest of that surgeon and he has the support facilities of a major pediatric hospital to provide safety in care and planning.

Ian T. Jackson
Ian R. Munro
Kenneth E. Salyer
Linton A. Whitaker

CONTENTS

Chapter 1

INTRODUCTION TO CRANIOMAXILLOFACIAL SURGERY

This atlas shows the techniques used by the majority of the authors in November 1980. It is not a compendium of all known craniofacial techniques. Three of the four authors have learned craniofacial surgery directly from Dr. Paul Tessier. Modifications of his original teaching are the result of personal preference and the locale in which the surgery has developed. In addition, some new techniques have been added. It is inevitable that the authors do not agree on all minor points of technique or philosophy. This atlas illustrates techniques used by at least three of the four authors. When there have been differences on a 2:2 basis, either the subject has been omitted or both alternatives have been included. Each author is currently developing new techniques to improve the quality of results or to increase the speed of surgery. These new techniques have not been described either because of lack of unanimity of their validity or because of insufficient follow-up time to be certain of long-term results. This atlas should not be used as a reference for undertaking this surgery. Each surgical and anesthetic specialist needs specific training from an established craniofacial team before embarking on this specialty. Thus, this atlas should be used as a guide to elucidate specific points. The possibility of major complications is inherent in the operations described. For orbitocranial techniques, there are risks of brain damage, blindness, or other visual disturbances. All techniques described involve extensive subperiosteal stripping of bone. If infection occurs, it is extremely difficult to eradicate.

BASIC PRINCIPLES

Team

When Paul Tessier initiated this surgery, he involved many other specialists in order to delineate the multifaceted problems preoperatively and to evaluate postoperative results. The authors have abided by his philosophy, and each has developed a similar team.

The team concept is essential (1) for investigating all aspects of the deformity; (2) for ensuring safety in managing these patients; and (3) for providing documentation of long-term results, which facilitates the development of new ideas.

The major craniofacial deformities are rare. We believe that regionalization of craniofacial teams is mandatory. Centralization has the advantage of providing a sufficient number of patients to maintain a high level of expertise and experience. As a result, the safety of the surgery is enhanced. The facilities required for treatment of these patients are extensive, and a satisfactory cost-benefit ratio can only be maintained if a sufficient number of patients are being treated. In addition, only if enough data are collected on many patients can the true value of each technique be ascertained. These arguments have proved valid in the comparable treatments of renal transplants and cardiac surgery.

Presurgical assessment

CRANIOFACIAL SURGEON

This person must coordinate the team and discuss each patient at a conference with other team members. His own clinical judgment depends on experience. It takes many years to be able to recognize the more subtle distortions of the craniofacial region. The surgeon makes an initial judgment of soft tissue displacement and how this may be related to an underlying skeletal abnormality. He makes a preliminary assessment of how the deformity may be affecting the psychosocial interaction of the patient, his parents, and peers. He may be able to make some initial decision about the appropriate age for surgery. However, it has been our experience that the patient is less likely to discuss his true motivation for requesting surgery with the surgeon than he is with the psychiatrist and social worker.

NEURORADIOLOGIST

Cephalometric radiographs have been the mainstay in evaluating facial skeletal deformities for many years. However, they have little value in analyzing the majority of deformities considered in this atlas. These radiographs give only a single two-dimensional view of either the profile skeleton or the anteroposterior skeleton. They can give little appreciation of the three-dimensional distortion that occurs. However, the soft tissue cephalogram can be useful in planning soft tissue contour correction related to underlying skeletal movements. Because we are attempting to produce a normal external appearance, it is frequently necessary to ignore abnormal cephalometric angles. This is particularly important when there is a cranial base abnormality that will preclude the use of all other angle measurements.

Most severe craniofacial deformities need to be evaluated with multiview polytomography and CAT scans. Tomograms in the AP plane show vertical height abnormalities and some transverse problems. Basal (axial) tomograms are essential for determining transverse relationships and different AP lengths, particularly in the orbits. Lateral tomograms are used rarely, but tomograms rotated in direct relationship to a specific abnormality may be useful, such as in evaluating facial clefts in Treacher Collins syndrome and examining the optic canal or temporomandibular joint.

The CAT scan in basal or AP view is essential for showing hydrocephalus, which frequently occurs in craniofacial dysostosis of Crouzon or Apert syndrome, thus, demonstrating the possible need for preoperative cerebrospinal fluid shunting. In addition, it shows central defects associated with encephaloceles or meningoceles in the anterior cranial fossa. It can show soft tissue abnormalities within the orbit and also be used to measure differences in soft tissue thickness over such areas as the zygomas.

Although preoperative radiographs and measurements are essential in planning surgery, not all defects are visible. In patients with orbital hypertelorism, there are frequently small meningoceles in the region of the foramen cecum that cannot be seen. Small spicules of bone may protrude from the orbital roof and invaginate the dura over the frontal lobes. Failure to diagnose these problems during surgery is more likely to result in dural tears and cerebrospinal fluid leaks.