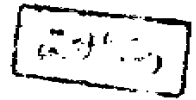


Assessment of Recent Methods of Craniofacial Osteosynthesis



*Thesis submitted for partial fulfillment of the Master
Degree in General Surgery*

Presented by

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1998





بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

The first part of the paper discusses the importance of the research and the objectives of the study. It highlights the need for a comprehensive understanding of the subject matter and the role of the researcher in this process. The second part of the paper presents the methodology used in the study, including the data collection methods and the analysis techniques. The third part of the paper discusses the results of the study and the conclusions drawn from the findings. The final part of the paper provides a summary of the key points and offers suggestions for future research.

The research was conducted in a systematic and rigorous manner, following the principles of scientific inquiry. The data was collected from a representative sample of the population, and the analysis was performed using advanced statistical techniques. The results of the study are presented in a clear and concise manner, allowing for a thorough understanding of the findings. The conclusions drawn from the study are based on the evidence presented and are supported by the data. The suggestions for future research are based on the limitations of the study and the need for further exploration of the subject matter.

The study has several strengths, including the use of a large sample size and the application of advanced statistical methods. However, there are also some limitations to the study, such as the potential for bias in the sample and the limitations of the data collection methods. Despite these limitations, the study provides valuable insights into the subject matter and contributes to the existing body of knowledge. The findings of the study are discussed in detail in the following sections, and the conclusions are drawn from the evidence presented.

The study was conducted in a systematic and rigorous manner, following the principles of scientific inquiry. The data was collected from a representative sample of the population, and the analysis was performed using advanced statistical techniques. The results of the study are presented in a clear and concise manner, allowing for a thorough understanding of the findings. The conclusions drawn from the study are based on the evidence presented and are supported by the data. The suggestions for future research are based on the limitations of the study and the need for further exploration of the subject matter.

Acknowledgment

I would like to present my profound and sincere gratitude to my supervisor, Dr. Amr Salah, Assistant Professor of Plastic and Reconstructive Surgery, Faculty of Medicine, Ain Shams University for dedicating much of his valuable time to provide me a wide scope of knowledge in all the essential aspects of this study, he encouraged me very much. He was the driving force behind this thesis and without whom this work would have never seen light.

I greatly acknowledge Dr. Hazem Maher, Lecturer of Plastic Surgery, Faculty of Medicine, Ain Shams University who sacrificed a great deal of his valuable time in the correction of this work and for whom no words or praise are sufficient. I would like to take this opportunity to thank him for all kindness he has shown me in the past.

I would like also to thank all the staff members of the Plastic Surgery Department for their aid and encouragement in providing material and knowledge in this thesis.

I would like to thank my parents for their support and continued sacrifice that made this thesis come true.

Asser El-Hilaly

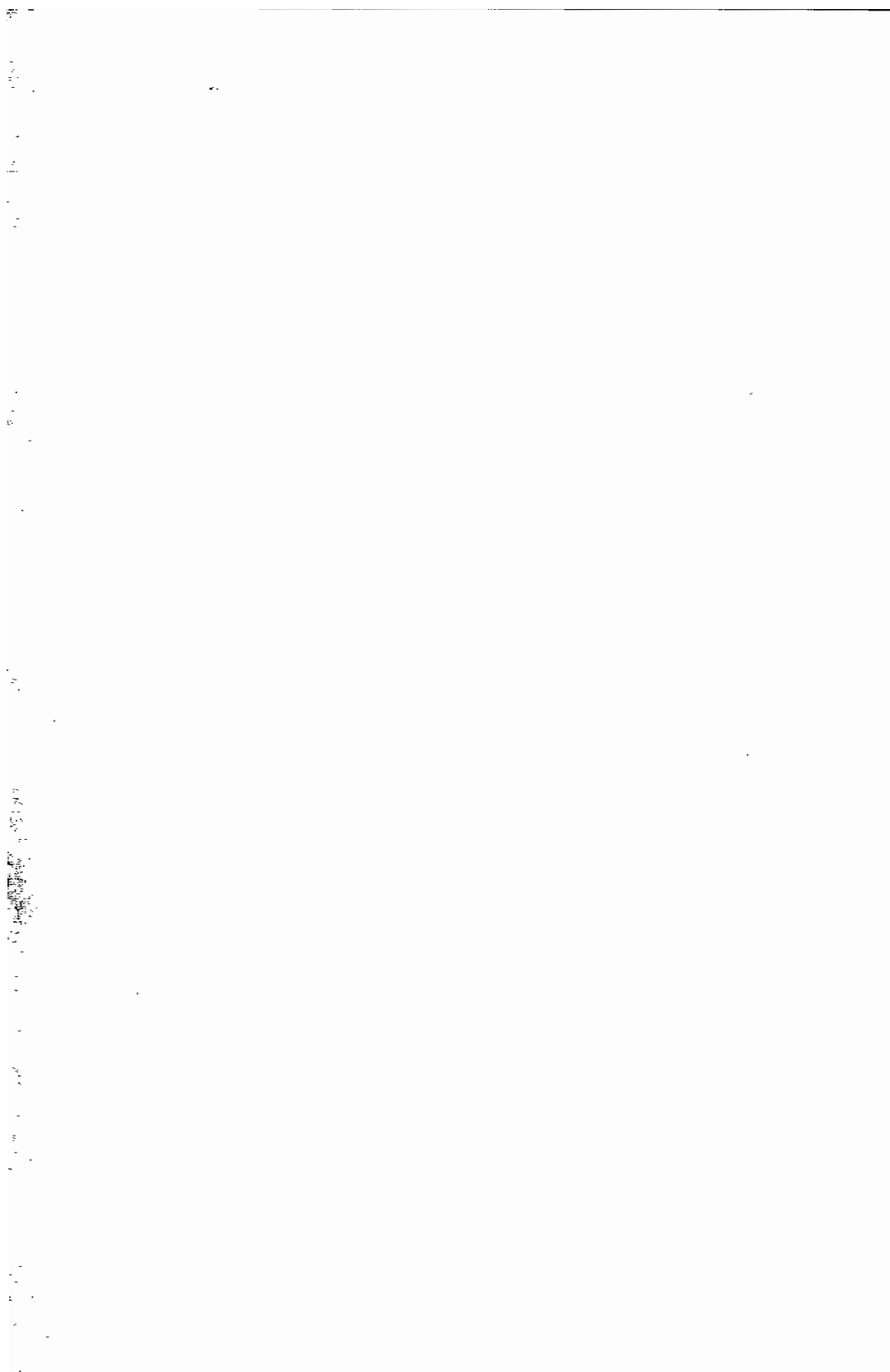
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*Introduction and
Aim of the Work*





INTRODUCTION

Rigid plate and screw fixation has become the mainstay in the treatment of facial fractures and also in the fixation of osteomized segments. Plate and screw architecture has been improved throughout the years giving us state-of-the-art devices for craniofacial fixation. This was mainly due to their unmatched ability to maintain stable bone position in three dimensions. Sizes, materials and even specifications have widely varied from their first introduction in 1886 by Hansman (*Dufresene, 1982*).

Classically, osteosynthesis of the facial skeleton has been performed using interosseus wires. Other methods have been also employed such as K-wires, IMF and others. In 1886, Hansmann was the first to use plate and screws for this objective. He immobilized bone segments using a 3 hole plate. Since then innumerable reports of cranio-maxillo-facial osteosynthesis using plate and screws have appeared (*Dufresene, 1982*).

Hansmann's experience, however, was not widely accepted and ignored thereafter. This was due mainly to problems with infection and technical failures that resulted. In 1949, Dannis, used the principle of axial compression for the plating of long bones with a great degree of success. This was by all means the spark of ingenuity in this field (*Munro, 1989*).



In the 1950s, a Swiss study group intensified the work in this area. In a multi-disciplinary approach specialists from various fields such as surgery, engineering, metallurgy, anatomy and pathology joined their efforts in developing a specific armamentarium. This led to a more systemic approach in the development of implants, instruments and techniques. A breakthrough could then be observed when their first textbook appeared in 1963. This textbook described the principles of internal fixation in details. Certainly some overlapping indications existed for the different methods, but stable operative fixation presented its advantages (*Rahn, 1989*).

Their work (AO/ASIF) was first directed towards the mandible. Occasionally implants have been used in the maxillo-facial area; but this was the first systemic approach towards this area. The Swiss' positive experience lead several surgeons and scientists to adopt their principles. In 1968, Luhr published the use of rigid internal fixation for mandibular fractures (*Luhr, 1968*).

As the mandible constitutes a major pillar in skull, all the preceding literature in this field was biased towards it. In 1976, after a decade of clinical experience in using the principles of the Association for the Study of Internal Fixation (AO/ASIF), Spiessel was able to outline the concepts of rigid fixation of the mandible (*Spiessel, 1976*).



In the midface, the implants used were initially borrowed from the field of hand surgery and eventually modified. In 1967, Snell used metacarpal plates for fractures of the midface as well as for the mandible. In 1972, Michelet and Festal used first to publish a report of the use of special small plates and screws for the midfacial fractures. Subsequently, Harle and Duker (1975), Champy et al (1978), Luhr (1979) and Horster (1980) also published reports of the use of plates and screws in the mid-facial area.

Utilizing the principles of mandibular compression system, Luhr designed a mini-compression system. They were in a variety of sizes and shapes making them adaptable for the midface. Initially there were several doubts in North America regarding the use of plates and screws in the midface. It was felt that bones were too thin to hold the screw and that the use of the system would add considerable amount of time to the surgery. Also, Tessier had taught many people how to use wires and bone grafts to provide an effective degree of rigidity in fixation. Subsequently, the objections proved to be invalid and it was found that plates and screws provide a much greater degree of rigidity than wires (Munro, 1989).

Luhr's plating system being indulged by his previous experience where also based on compression



osteosynthesis. Compression however, proved to be not always necessary for the healing of maxillo-facial fractures or osteotomies. Not only that but the fact that compression stimulates osteogenesis was not universally accepted. Furthermore it was noticed by Munro that compression osteo-synthesis distorts a previously adjusted osteotomy line. These disadvantages lead Luhr and other (*Champy, 1978*) to develop a non-compression miniaturized plating system for the use in the midface and upper cranium.

When craniofacial surgeons realized the advantages of plates and screws over wires, they started using the system more cephalad on the skeleton and around the orbits and even the skull. Surgeons, working on infant skulls, soon found that even the shortest screw was too long for the thin skull of young children. This lead to the production of shorter screws. However because of the distance between the threads only one turn of the screw was available to obtain screw purchase in the bone. Custom made short screws with a tighter thread was the further improvement (*Munro, 1989*).

Not only was the screw size becoming smaller but also there was a necessity for an even smaller size plate. This gave the surgeons the ingenuity to produce a "micro-system" with plates only half the size of miniplates. They made cranio-facial surgery in children much easier. Not