



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكرو فيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم



شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



MONA MAGHRABY



Primary Hinged External Fixator for Complex Fracture Dislocations of the Elbow: Systematic Review and Meta-Analysis

*Submitted for Partial Fulfillment of
Master Degree in Orthopedic Surgery*

By

Ahmed Medhat Mohamed

M.B.B.Ch., Faculty of Medicine, Ain Shams University

Under Supervision of

Prof. Dr. Salah Abouseif, MD

Professor of Orthopedic Surgery

Faculty of Medicine - Ain Shams University

Prof. Dr. Mohamed Alkersh, MD

Associate Professor of Orthopedic Surgery

Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University
2021

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالَ

لَسْبَدَانِكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْعَظِيمُ

صدق الله العظيم

سورة البقرة الآية: ٣٢

Acknowledgments

*First and foremost, I feel always indebted to **Allah** the Most Beneficent and Merciful.*

*I wish to express my deepest thanks, gratitude and appreciation to **Prof. Dr. Salah Abouseif, MD**, Professor of Orthopedic Surgery, Faculty of Medicine, Ain Shams University, for his meticulous supervision, kind guidance, valuable instructions and generous help.*

*Special thanks are due to **Prof. Dr. Mohamed Alkersh, MD**, Associate Professor of Orthopedic Surgery, Faculty of Medicine, Ain Shams University, for his sincere efforts, fruitful encouragement.*

I would like to express my hearty thanks to all my family for their support till this work was completed.

Ahmed Medhat Mohamed

List of Contents

Title	Page No.
List of Tables.....	i
List of Figures.....	ii
List of Abbreviations.....	v
Introduction	1
Aim of the Study	2
Review of Literature	4
Patients and Methods.....	44
Results.....	49
Discussion	65
Summary.....	72
Conclusion	74
References	75
Arabic Summary	

List of Tables

Table No.	Title	Page No.
Table 1:	Included papers	49
Table 2:	Wound infection/pin-tract infection	50
Table 3:	2ry ulnar or humeral shaft fractures.....	52
Table 4:	Incongruent joint	54
Table 5:	Persistent instability	55
Table 6:	Non-union	56
Table 7:	Heterotrophic calcification	57
Table 8:	Nerve injury	58
Table 9:	QUICK-DASH score	59
Table 10:	MEPS: Mayo Elbow Performance Score	60
Table 11:	Range of motion	62
Table 12:	Comparison between our results and Ezequiel E Zaidenberg et al 2020 and Fushan Hou et al 2019 regarding number of patients, ROM (Flexion and extension arc), ROM (pronation and supination arc), heterotrophic calcification, arthritis (after only 1 year), DASH score and MEPS score.....	67

List of Figures

Fig. No.	Title	Page No.
Fig. 1:	Elbow joint articulations.....	4
Fig. 2:	Bony landmarks of the distal humerus	6
Fig. 3:	Showing ligaments of elbow joint.	9
Fig. 4:	(a) Digitally reconstructed radiograph (DRR) that simulates fluoroscopic images, (b) example of an axis estimated by one of the surgeons (red line) and the calculated rotation axis (white line) in a 3D reconstructed image, showing the surgeons' error.....	13
Fig. 5:	Modified schematic drawing demonstrating the flexion-extension “arc of injury,” which relates fracture types to elbow position at the moment of impact	15
Fig. 6:	Modified schematic drawing of the circle of Hori in dislocation of the elbow.....	16
Fig. 7:	Radiographs of posterior dislocation of the elbow with fracture of radial head (a) and posterior dislocation of the elbow with fracture of the radial head and coronoid, so-called terrible triad (b).	18
Fig. 8:	Radiographs of trans-olecranon fracture dislocation(a) and posterior olecranon fracture-dislocation representing the most proximal type of posterior Monteggia type fracture	19
Fig. 9:	Mayo Classification of olecranon fractures	23
Fig. 10:	Hotchkiss' modification of the Mason classification for radial head and neck fracture classification.	25
Fig. 11:	Modified drawing of O'Driscoll's classification of coronoid fracture	27

List of Figures cont...

Fig. No.	Title	Page No.
Fig. 12:	Postoperative anteroposterior (A) and lateral (B) radiographs demonstrating concentric reduction of the ulnohumeral joint in a hinged external fixator and lateral ulnar collateral ligament reinsertion using an anchor and radial head replacement	34
Fig. 13:	Treatment algorithm using hinged external fixation in unstable elbow fracture dislocation.....	38
Fig. 14:	Identification of bony landmarks.....	39
Fig. 15:	Lateral elbow x-ray view showing the concentric overlap of the capitulum humeri (black dashed circle), medial trochlea humeri (white dotted circle) as well as the media "trochlear cheek" (black solid circle).	40
Fig. 16:	Dissection to the bone where P1 =Anterior humeral shaft, P2 =central aspect of the lateral humeral shaft and P3= posterior humeral shaft.	41
Fig. 17:	K-wire insertion and modulation inside elbow axis of rotation.....	43
Fig. 18:	PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analysis) flow diagram for study selection.....	48
Fig. 19:	Wound infection/pin-tract infection in the 3 studies.....	50
Fig. 20:	Wound infection/pin-tract infection in our study.....	51
Fig. 21:	2ry ulnar or humeral shaft fractures in the 3 studies.....	53
Fig. 22:	2ry ulnar or humeral shaft fractures in our studies.....	53

List of Figures cont...

Fig. No.	Title	Page No.
Fig. 23:	Incongruent joint in our study	54
Fig. 24:	Persistent instability in our study.....	55
Fig. 25:	Non-union in our study	56
Fig. 26:	Heterotrophic calcification in our study.....	57
Fig. 27:	Nerve injury in our study.....	58
Fig. 28:	MEPS: Mayo Elbow Performance Score in the 3 studies.....	61
Fig. 29:	MEPS: Mayo Elbow Performance Score in our study	61
Fig. 30:	Range of motion in our study.....	62

List of Abbreviations

Abb.	Full term
AMCL	Anterior medial collateral ligament
DASH score	Score of disability of arm , shoulder and hand
HEF	Hinged external fixator
LCL	Lateral collateral ligament
LUCL	Lateral ulnar collateral ligament
MCL	Medial collateral ligament
MEPS.....	Mayo elbow performance score
ORIF	Open reduction and internal fixation
PLRI	Posterolateral rotatory instability
PRUG	Proximal joint of the radius and ulna
RCL	Radial collateral ligament

INTRODUCTION

Knowledge of the static and dynamic stabilizers of the elbow is essential for the understanding the underlying pathology and choice of treatment strategy.¹

High-energy and fracture dislocations with compromise of the medial and lateral ligamentous complex, the joint capsule, and potentially the tertiary stabilizers (i.e., the flexor pronator, extensor supinator masses, and brachialis) often demonstrate residual instability after osseous and ligamentous stabilization.²

The optimal management of a complex elbow injury should result in restoring joint stability and its full range of motion. However, this is often difficult to achieve by surgical means and a marked restriction of movement remains a frequent consequence of severe elbow injury.³

This systematic review discusses the usage of hinged external fixator of the elbow as a primary method of fixation in complex elbow fracture-dislocations.

The primary therapeutic objectives are to maintain concentric elbow reduction and stability by the spanning effect of the fixator and avoid joint stiffness by allowing early range of motion provided by the rotation around the axis of the fixator's hinge at the same time as protecting osseous and ligaments healing. Nevertheless, the application of this type of fixator is technically demanding.⁴

AIM OF THE STUDY

The aim of this study is to discuss the results of using a lateral hinged external fixator as an adjunct stabilizer in the treatment of a variety of acute destabilizing elbow injuries as a primary method of fixation not only in chronic or complicated cases.

The application of an external fixator can be used statically as a temporary stabilization of the elbow as a "damage-Control surgery "for osteoligamentous lesions with extensive soft tissue damage and in polytrauma patients.

Over and above, a "dynamic" External fixator is a functional treatment for highly unstable osteo-ligamentous injuries and persisting tendency to dislocation of the joint and sometimes as a standalone procedure.

In some cases, the procedure is also used in distraction arthrolysis of stiff elbows and as a salvage procedure in patients with correlated comorbidities as part of fracture treatment.

The most common treatment of complex elbow fracture-dislocations is ORIF and ligament repair (particularly lateral collateral ligaments [LCL]) with the aim to gain back bone-articular surface and joint stability. Radial head prosthesis is sometimes essential when it is not feasible to reconstruct this structure.

Complex fracture-dislocations of the elbow, such as terrible triad injuries and olecranon fracture-dislocations may remain unstable after reconstruction of the bony and ligamentous structures.

Subsequently, the results of treating these injuries sometimes are disappointing because of post-traumatic instability, stiffness, and early arthrosis. Consequently, there is a need for further treatment and additional procedures regularly.

The dynamic external fixator enables protection against rotational, valgus and varus forces if used properly using the best possible centring of the humeroulnar articulation. This control of the joint guidance enables functional follow-up treatment by reducing the compromising forces on the osteoligamentous structures. To achieve the aim of this study, we formulated the following research questions:

- (1) In complex elbow fracture-dislocations, does treatment with a hinged external fixator result in reduction of disability and pain, and in improvement in ROM, function, and quality of life?
- (2) What are the complications seen after external fixator treatment?