

The Outcome of Arthroscopic Repair of Rotator Cuff Tears Using the Double-Row Technique

Thesis

Submitted for partial fulfilment of MD degree
in orthopedic surgery

By

Wessam Eldin Fakhery Ebied

M.B., B.Ch, M.Sc. Orthopedic surgery
Ain Shams University

Under Supervision of

Prof. Dr. Ahmed Mohamed Elsaeed

Professor of Orthopedic Surgery
Faculty of Medicine – Ain Shams University

Dr. Sherif Ahmed El Ghazaly

Professor of Orthopedic Surgery
Faculty of Medicine – Ain Shams University

Dr. Hisham Mohamed Kamal

Lecturer of Orthopedic Surgery
Faculty of Medicine – Ain Shams University

Orthopedic Department

Faculty of Medicine

Ain Shams University

2018

Acknowledgments

First and forever, thanks to **Allah**, Almighty for giving me the strength and faith to complete my thesis and for everything else.

I would like to express my deepest gratitude and appreciation to **Prof. Dr. Ahmed Mohamed Elsaeed, Professor of Orthopedic Surgery, Faculty of Medicine – Ain Shams University**, for his generous support and guidance to help me to put this work in its best form and for being an ideal model of a professor to follow. It was indeed an honor to work under his supervision.

It is my pleasure to express my unlimited gratitude and deepest thanks to **Prof. Dr. Sherif Ahmed El Ghazaly , Professor of Orthopedic Surgery, Faculty of Medicine – Ain Shams University** for his kind assistance and supervision.

No words can express my gratitude towards **Dr. Hisham Mohamed Kamal, Lecturer of Orthopedic Surgery, Faculty of Medicine – Ain Shams University**, for the efforts and time she has devoted to accomplish this work.

I would like also to thank **Dr. Mostafa Ali Al-Abd, Lecturer of Orthopedic Surgery, Faculty of Medicine – Ain Shams University**, for his precious help, valuable advice and guidance.

I feel greatly indebted to all my family, without their great efforts, encouragement, help and support this work could not become.

Table of Contents

Table of Contents

Introduction	1
Aim of the Work.....	4
Review of Literature	
Relevant anatomy and biomechanics of rotator cuff	5
Aetiology of Rotator cuff tear.....	17
Pathophysiology and Mechanics of Rotator cuff tears	26
Classification of Rotator cuff tears	28
Diagnosis of Rotator Cuff Tears	45
Treatment Of Full Thickness Rotator Cuff Tears.....	62
Principles Of Arthroscopic Repair Of Full-Thickness Rotator Cuff Tears	70
Shoulder Outcomes Measures.....	95
Rehabilitation after Rotator Cuff Repair	99
Patients and methods	101
Results.....	124
Discussion	142
Summary and Conclusion	156
Case discussion	160
References	178
.....الملخص العربي	

List of Figures

Figure 1 layers of the supraspinatus and infraspinatus tendons.	6
Figure 2 Footprint of supraspinatus, infraspinatus and teres minor on cadaver.	8
Figure 3 A An illustration based on the traditionally accepted concept of the anatomy of the humeral insertions.	9
Figure 3 B An illustration based on the recent anatomic humeral insertional anatomy.	9
Figure 4 Balanced anteroposterior cuff forces compress the humeral articular convexity into the glenoid concavity.	12
Figure 5 The rotator cable.	13
Figure 6 Suspension bridge model for rotator cuff tear.	6
Figure 7 Articular surface of the cuff is viewed through the posterior portal.	15
Figure 8 Acromion morphology.	18
Figure 9 A= The critical shoulder angle. B=The acromion index C= The lateral acromion angle	19
Figure 10 Elman partial supraspinatus tear.	20

List of Figures

Figure 11 Habermeyer Classification. Type 1 tear (A): small tear within transition zone from cartilage to bone. Type 2 tear (B): extension of tear up to centre of footprint. Type 3 tears (C): extension of tear up to greater tuberosity.	30
Figure 12 Habermeyer classification. Extension of articular-sided supraspinatus tendon tear in transverse plane. (a) Type A tear. Tear of coracohumeral ligament continuing into medial border of supraspinatus tendon. (b) Type B tear. Isolated tear within crescent zone. (c) Type C tear. Tear extending from lateral border of pulley system over medial border of supraspinatus tendon up to area of crescent zone.	30
Figure 13 Collin classification.	34
Figure 14 patterns of full thickness rotator-cuff.	35
Figure 15 Type 1 Crescent tear.	36
Figure 16 (a) L-shaped longitudinal tear. (b) U-shaped longitudinal tear.	37
Figure 17 Massive contracted tear.	37
Figure 18 Patte Classification.	16
Figure 19 Goutallier classification.	42
Figure 20 The occupation ratio.	43
Figure 21 Tangent sign.	44

List of Figures

Figure 22 A, Internal rotation B, external rotation strength testing.	47
Figure 23 A Neer sign - B: Hawkins' test.	48
Figure 24 The lift-off test.	49
Figure 25 The internal rotation lag sign.	49
Figure 26 Supraspinatus strength testing.	26
Figure 27 External rotation lag sign.	53
Figure 28 Hornblower's sign.	54
Figure 29 Chronic rotator cuff tear with arthropathy evident on plain radiograph.	55
Figure 30 Evaluation of the acromion index.	56
Figure 31 The critical angle.	56
Figure 32 normal, healthy supraspinatus tendon.	57
Figure 33 Coronal cut showing full thickness rotator cuff tear.	58
Figure 34 Full-thickness rotator cuff tear evaluated on the sagittal oblique view.	58
Figure 35 The healthy supraspinatus muscle should nearly fill the bony suprascapular fossa on the sagittal MRI.	59

List of Figures

Figure 36 Chronic rotator cuff muscle atrophy is best appreciated on the sagittal oblique view.	60
Figure 37 MRI showing torn subscapularis tendon.	60
Figure 38 Mini open rotator cuff repair.	68
Figure 39 Creating a bleeding bone bed.	72
Figure 40 Repair of crescent-shaped rotator cuff tear.	73
Figure 41 Repair of U-shaped rotator cuff tears.	74
Figure 42 Repair of a chronic L-shaped rotator cuff tear.	74
Figure 43 Proper anchor insertion at the deadman angle.	77
Figure 44 (A) Tight suture loop (B) Loose suture.	78
Figure 45 single row rotator cuff repairs.	80
Figure 46 (A) The original double-row rotator cuff repair. (B) Suture-bridging double-row repair.	83
Figure 47 Double-row rotator cuff repair strategy utilizing two medial mattress sutures and two lateral simple sutures.	84
Figure 48 Double-row rotator cuff repair strategy utilizing medial “puncture” sutures that are bridged laterally to two additional points of fixation.	85

List of Figures

Figure 49 beach chair position and portals position.	106
Figure 50 subacromial decompression.	110
Figure 51 preparation bleeding bone bed.	111
Figure 52 Medial row anchors placement.	114
Figure 53 (A) Fast Scorpion suture passer (Arthrex) (B), BirdPeak suture passer (Arthrex)	115
Figure 54 Passing suture tails through the rotator cuff.	116
Figure 55 sliding knot	118
Figure 56 Tying the medial row sutures	119
Figure 57 Insertion of the lateral row knotless anchors.	119
Figure 58 The final repair.	120
Figure 59 pendulum exercises.	122
Figure 60 Assisted forward elevation.	123
Graph 1 Gender distribution in the study group.	125
Graph 2 Dominance distributions in the study group.	126
Graph 3 Level of activity distribution in the study group.	126
Graph 4 Time interval between complaint onset and operation.	127

List of Figures

Graph 5 Acromion type distribution across the patients.	128
Graph 6 Improvement of pain score.	129
Graph 7 Improvement of external rotation at 0 ⁰	130
Graph 8 Improvement of external rotation at 90 ⁰	130
Graph 9 Improvement of internal rotation at 90 ⁰	131
Graph 10 Improvement of abduction.	131
Graph 11 Improvement of forward flexion.	131
Graph 12 Improvement of ASES.	132
Graph 13 Improvement of constant score.	133
Graph 14 Improvement of DASH score.	134
Graph 15 Tear size distribution.	136
Graph 16 Fatty degeneration pie chart distribution of the study group.	136
Graph 17 Age Groups	137
Figure 61 AP xray of right shoulder	163
Figure 62 A: Coronal MRI cut B: Sagittal MRI cut showing rotator cuff tear	163
Figure 63 A,B Showing postoperative improvement.	166
Figure 64 MRI right shoulder showing full thickness	168

List of Figures

rotator cuff tear	
Figure 65 A,B,C,D Showing postoperative improvement	171
Figure 66 A:Coronal MRI cut B: Sagittal MRI cut	174
Figure 67 A,B,C,D Showing the surgical debridement	177
Appendix 1 ASES score	199
Appendix 2 Constant-Murley score	200
Appendix 3 DASH score	201
Appendix 4 Patients Data	202

List of Tables

Table 1 Dimensions of the Posterosuperior Cuff Insertion.	7
Table 2 Stages of Impingement syndrome.	17
Table 3 Ellman classification of partial thickness rotator cuff tears.	28
Table 4 Ellman classification of rotator-cuff tear.	32
Table 5-A: Snyder classification for partial lesions- B : Snyder classification for full thickness lesions	33
Table 6 Davidson and Burkhart geometric classification for full thickness cuff tear.	38
Table 7 Patte Classification for Full· thickness Rotator Cuff Tears.	40
Table 8 Principles of rotator cuff repair.	69
Table 9 The distribution of patients according the duration of symptoms.	127
Table 10 improvement in range of movement.	130
Table 11 Improvement in functional outcomes.	135
Table 12 Results according to age.	138
Table 13 Comparison between sex and pain, ASES,	139