Arthroscopic-Assisted Limited Carpal Fusion

Thesis

Submitted for partial fulfillment of M.D. degree in Orthopedic Surgery

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Abdelrahman A. Diaa Eldin Eldiasty

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List of Abbreviations

3C	Three corner
4C	Four corner
AVN	Avascular necrosis
BMP	Bone morphogenic protein
CH	Capitohamate
CL	Capitolunate
CMC	Carpometacarpal
COR	Center of Rotation
CRPS	Complex regional pain syndrome
CT	Computed tomography
DASH	Disabilities of the arm, shoulder and hand score
DCR	Distal carpal row
DISI	Dorsal intercalated segment instability
DT	Dart throwing
DTM	Dart thrower's motion
ECRB	Extensor carpi radialis brevis
ECRL	Extensor carpi radialis longus
ECU	Extensor carpi ulnaris
FCR	Flexor carpi radialis
FCU	Flexor carpi ulnaris
Fig.	Figure
FRM	Functional range of motion
LC	Lunocapitate
LRLL	Long radiolunate ligament
MMWS	Modified Mayo wrist score
MRI	Magnetic resonance imaging
MWHWS	Modified Wrightington hospital wrist score
OA	Osteoarthritis
ORIF	Open reduction internal fixation
PCR	Proximal carpal row
PRC	Proximal row carpectomy
PXR	Plain x-ray
RBSM	Rigid body spring model method RBSM
RL	Radiolunate
ROM	Range of motion
RS	Radioscaphoid
RSCL	Radioscaphocapitate ligament
RSL	Radioscapholunate
SC	Scaphocapitate
SCL	Scaphocapitolunate
SCLH	Scaphocapitolunohamate
S-L, SL	Scapholunate
SLAC	Scapholunate advanced collapse
SNAC	Scaphoid non-union advanced collapse
STT	Scaphotrapeziotrapezoid
TqH	triquetriohamate
VAS	Visual analogue scale
VISI	Volar intercalated segment instability

Arthroscopic-Assisted Limited Carpal Fusion

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Abstract

Background: Osteoarthritis of the wrist is a common condition that is seen in multiple age groups. In certain patients, the wrist osteoarthritis pattern only affects a few of the intercarpal wrist joints or a portion of the radiocarpal joint. In these patients, limited carpal fusion is considered as a viable motion-preserving salvage procedure. Arthroscopic intervention combined with percutaneous fixation technique in limited wrist fusion has many potential advantages of minimal surgical damage to the supporting ligaments and capsular structures of the wrist while allowing an unimpeded view to most articular surfaces of the joints and important ligaments. This ensures a more accurate staging of the arthritis and facilitates better decision making on the most appropriate choice of fusion**.** The current study evaluates short term results of arthroscopic-assisted limited carpal fusion in the management of wrist arthritis as regards: time and rate of union, pain improvement, functional outcome and occurrence of complications.

Methods: A prospective study of arthroscopic-assisted limited carpal fusion in patients with post-traumatic limited wrist osteoarthritis including: scapholunate advanced collapse (SLAC), scaphoid nonunion advanced collapse (SNAC), Kienböck's disease, radiocarpal joint arthrosis, and scaphotrapeziotrapeziod (STT) arthritis, and chronic painful carpal instabilities with or without secondary arthritic changes. During the follow-up visits, Range of motion and grip strength were measured and recorded as percentages of the values of the unaffected extremities. MMWS, MWHWS and VAS scoring systems were used for assessment of the patients. The primary outcome was compared at 3, 6 ,12, and 24 months. Dichotomous and continuous variables were compared with Statistical Program for Social Science (SPSS) version 18. The level of significance was set at $p < 0.05$. Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

Results: Twenty consecutive cases of arthroscopic assisted limited carpal fusion were performed in the period between October 2012 and October 2014. Eleven patients had arthroscopic assisted four corner fusion for SNAC. Mean operative time was 145.45 minutes and average follow-up was 14.91 months. All cases achieved union in an average of 7.91 weeks. Postoperatively flexion ROM increase was not significant. However, extension, grip strength and functional results as reflected by VAS, MMWS, and MWHWS were improved significantly. Nine patients had arthroscopic assisted scaphocapitate fusion for Kienböck's disease. Mean operative time was 115.56 minutes and average follow-up was 12.11 months. All cases except one achieved union in an average of 6.75 weeks. Postoperatively although the ROM increase was not significant, grip strength and functional results as reflected by VAS, MMWS, and MWHWS were improved significantly.

Conclusions: This cohort study demonstrates that arthroscopic assisted limited carpal fusion is a feasible option for the treatment of limited wrist arthritis with promising functional results.

Key words: limited carpal fusion, partial wrist arthrodesis, wrist arthroscopy

Introduction

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Aim of work

INTRODUCTION

Osteoarthritis of the wrist is a common condition that is seen in multiple age groups. If the degenerative changes have spread throughout the carpus and radiocarpal joint, treatment is generally directed to arthrodesis of the entire wrist, thus providing a stable, pain-free wrist, or total wrist arthroplasty, which eliminates pain but allows some functional arc of motion. [1]

In certain patients, the arthritis pattern only affects a few of the intercarpal wrist joints or a portion of the radiocarpal joint, if it has not gotten to the stage in which it affects all of the joints throughout the wrist. [1]

In these patients, partial wrist fusion or limited carpal fusion is considered as a motion-preserving salvage procedure for multiple painful wrist conditions. It is a good alternative particularly for those patients who would prefer a mobile functional wrist rather than solid total wrist fusion. [2]

A variety of partial wrist fusions have been designed in the past to address problems arising from various parts of the wrist. [3, 4]

The fusion can take place between the radius and the proximal carpal row, between the 2 carpal rows and within the proximal carpal row. [5]

Because the wrist has complex articulations that provide its overall function, some motion is always lost owing to partial wrist arthrodesis. However, the maintenance of perfect congruity of the remaining joints that provide motion can provide long-term pain relief and the lack of further secondary degenerative changes. [6]

The operations being described in the literature and commonly in use are open surgery requiring much soft tissue dissection, including capsular and ligament incisions around the wrist to expose the carpal intervals. This may lead to iatrogenic stiffness of the joint on top of the mechanical constraint rendered by selected carpal fusion. [5]

The expected loss of motion can be predicted theoretically from the biomechanical models, although in practice, the final range of motion retained clinically will also rely on the degree of soft tissue contracture and the amount of compensatory hypermobility of the adjacent mobile segments. Thus, it is desirable to minimize surgical insult to soft tissue so as to maximize the motion preservation that is always the interest of both the patients and the surgeons. [5]

Wrist arthroscopy has steadily grown from a mostly diagnostic tool to a valuable adjunctive procedure in the treatment of myriad wrist disorders. [7]

Arthroscopic intervention in partial wrist fusion has potential advantages of minimal surgical damage to the supporting ligaments and capsular structures of the wrist while allowing an unimpeded view to most articular surfaces of the joints and important soft tissue elements. This ensures a more accurate staging of the arthritis and facilitates clinical decision making on the most appropriate choice of fusion. The remaining carpal motion can be maximized, and postoperative pain reduced, which favors rehabilitation. There is also cosmetic benefit with the minimal surgical scar. [5]

Combining with percutaneous fixation technique, arthroscopic partial wrist fusion can potentially generate the best possible functional outcome by preserving the maximal motion pertained with each type of partial wrist fusion because the effect of extra-articular adhesion associated with open surgery can be minimized. [5]

Aim of the Work

The aim of this work is to evaluate short term results of arthroscopic-assisted limited carpal fusion in the management of wrist arthritis as regards: time and rate of union, pain improvement, functional outcome and occurrence of complications.