Free vascularized versus non vascularized Medial Femoral Condyle Grafting in treatment of Scaphoid Nonunion

Thesis Submitted for Partial Fulfillment of M.D. Degree In Orthopaedic Surgery

By
Mostafa Ezzat Mahmoud
M.B., B.Ch
M. Sc. Orthopedic surgery

Under Supervision of

Prof. Dr. Ahmed Mahmoud Ateya
Professor of Orthopaedic Surgery
Cairo University

Prof. Dr. Ashraf NehadMoharram
Professor of Orthopaedic Surgery
Cairo University

Dr. Ayman Mahmoud Mansour
Lecturer of Orthopaedic Surgery
Cairo University

Dr. AymanAbdAlsameaShaheen
Lecturer of Orthopaedic Surgery
Cairo University.

Faculty of Medicine, Cairo University
2016

Abstract

Advanced scaphoid nonunion with large defects , severe flexion deformity and AVN is even more difficult to treat . Many lines of treatment have been advocated starting from non-vascularized grafting alone , grafting with fixation to vascularized grafts which could be pedicled or more technically demanding free vascularized graft . Medial femoral condyle is one of the site for free graft harvesting with very good early studies results .

From June 2013 to June 2016 a randomized controlled prospective study was conducted to compare the results of using free vascularized versus non vascularized medial femoral condyle grafting in advanced scaphoid nonunion with following criteria

(Key Words

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Lecturer of Orthopaedic Surgery
Cairo University.

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ACKNOWLEDGMENT

This work would not have been possible without the guidance and the help of several individuals who in one way or another contributed and extended their valuable assistance in the preparation and completion of this study.

First and foremost, my utmost gratitude to ***Prof.Dr. Ahmed Mahmoud (may Allah bless his soul)*** who was a great professor , teacher and father with endless support

Also great appreciation *for* ***Prof. Dr. Ashraf Nehad Moharram*** , **Dr. Ayman Mahmoud Mansour** and ***Dr. Ayman Shaheen*** for giving me the advantage of working under their supervision. They saved no effort to guide me in every aspect. Without their advice, valuable suggestions and criticism this study would not have been completed.

I would like to express my great appreciation to all staff members of the Orthopaedic department, Faculty of medicine, Cairo University, for their support and encouragement, and also my colleagues for their support.

Above all , I thank ***Allah***, for answering my prayers and for giving me the strength and will to go on.

Mostafa Ezzat Mahmoud

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List of abbreviations

AVN : Avascular necrosis .
CL : Capitolunate angle .
CC : Corticocancellous.
C-only : Cancellous only .
DIC : Dorsal intercarpal ligament.
DISI : Dorsal intercalated segment instability .
dRCa : dorsal radiocarpal artery .
dICa : dorsal intercarpal artery.
dSRa : dorsa supraretinacular arches.
DGA : Descending genicular artery .
DSLIL : Dorsal part of the scapholunate interosseous ligament.
ECA : Extensor compartment artery.
EPB : Extensor pollicis brevis .
FCR : Flexor carpi radialis.
FDMA : First dorsal metacarpal artery.
FMB : First metacarpalbase .
1,2-ICSRA : Intercompartmental supraretinacular artery .
2,3-ICSRA : Intercompartmental supraretinacular artery.
MFC : Medial femoral condyle .
MMWS : Modified Mayo wrist score .
MCR : Midcarpal radial portal.
PP : Proximal pole .
RSC : Radioscaphocapitate.
RLA : Radio lunate angle .
RA : Radial artery .
SNAC : Scaphoid nonunion advanced collapse .
STT : Scaphotrapezial ligament .
SLA : Scapholunate angle .
UA : Ulnar artery .

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Introduction

Scaphoid fracture is the most common carpal fracture. It accounts for approximately 60% to 90% of carpal and 11% of hand fracture. [1]

The term "scaphoid" is derived from the Greek word "skaph" which means skiff and is named for its likeness to a boat. However, the 3-dimensional shape of the scaphoid is more complex. The precise evaluation of the fracture configuration, angulation, displacement, and accuracy of screw placement is hindered by the peculiar twisted peanut like shape of the scaphoid.[2]

Besides its shape, the scaphoid is predominantly articular. With the predominantly articular nature of the scaphoid, there are few potential sites for the entrance of perforating vessels. It is well known that scaphoid has a tenuous vascular supply.[3]

Moreover, the scaphoid is the focus of ligamentous attachment. It is the key link of the wrist and govern the carpal kinematics. Therefore, preservation of the scaphoid anatomy and vascularity is critical for normal hand and wrist function.[3]

Scaphoid nonunion continues to present a unique clinical challenge. Natural history studies by **Mark** and colleagues**, Ruby** and colleagues, and **Linstrom** and **Nystrom** indicated an incidence of almost 100% of radiographic wrist arthritis between 5 and 20 years after scaphoid nonunion in symptomatic patients.[4]

Scaphoid nonunion complicated by proximal pole necrosis and humpback collapse remain a challenging clinical scenario. vascularized grafts which provide structural support as a volar wedge have demonstrated excellent rates of union, restoration of scaphoid geometry, and good clinical outcomes . Of these, the medial femoral condyle (MFC) graft has a robust and consistent vascular supply and optimal density of bone . it has become a promising alternative in the treatment algorithm for scaphoid nonunion.[5]

Aim of work

To compare the efficiency of free medial condyle vascularized grafting versus non-vascularized medial femoral condyle grafting in treatment of advanced scaphoid nonunion with large defects and/or avascular necrosis (AVN) and /or flexion deformity .

Anatomical consideration of the scaphoid nonunion

- **Skeletal anatomy :**

The scaphoid has an unusual shape; Four different regions . They are the tubercle, waist, distal pole, and proximal pole .

The scaphoid is 75% articular, especially the ulnar side. Proximally, the scaphoid articulates with the distal radius at the scaphoid fossa, and distally with the trapezoid and trapezium. Ulnarly, it articulates with the lunate proximally and the capitate distally.

The volar surface is partly nonarticular. The tubercle, which points radiovolarly, serves as an attachment for several ligaments and is also almost entirely covered by the crossing flexor carpi radialis (FCR) tendon. The scaphoid is oriented in the carpus with an intrascaphoid angle averaging approximately 40° in the coronal plane and 30° in the sagittal plane.[6]

- **Blood supply** (Figure 1) :

About 70 to 80% of the intraosseous vascularity and the entire proximal pole are supplied from branches of the radial artery entering through the radiodorsal ridge. Having a singular dominant intraosseous vessel predisposes the scaphoid to avascular necrosis and nonunion if fractured.[6]

The major palmar blood vessels arise from either the radial artery directly or the superficial palmar arch and divide into several smaller branches before coursing obliquely and distally over the palmar aspect of the scaphoid to enter through the region of the tubercle.[6]

In addition, **Herbert** and **Lanzetta** have hypothesized that there must be some blood supply through the scapholunate ligament complex. From their cases series, proximal pole fragments remained viable when their only remaining attachment was to the scapholunate ligament. [7]