Radiological Outcome of Scaphoid Nonunion treated with modified Matti-Russe Technique.

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ABSTRACT

Objective: To determine the radiological outcome of Scaphoid nonunion treated with modified Matti-Russe technique.

Methods: This descriptive study was conducted in Department of Orthopedics Khyber teaching hospital Peshawar from 23rd June 2017 to 23rd June 2020. All patients with Scaphoid nonunion fulfilling the inclusion criteria were treated with modified Matti-Russe technique. Regular follow up was done and radiological union was confirmed with X ray wrist AP and lateral View.

Results: The total number of patients enrolled in our study were 16. Male patients were 14(87.5%) and female were 2(12.5%). Mean age was 32.5±5.87 years. Right sided scaphoid non-union was present in 10(62.5%) patients and left in 6(37.5%) patients. Mean time since fracture at presentation was 17 ±4.49 weeks(range 12 to 18.3 weeks).Post operatively all patients achieved radiological union. The average union time was 15±2.5 weeks (range 13.4 to 16 weeks). No major complication noted.

Conclusion: Modified Matti-Russe technique is a reliable option for the treatment of Scaphoid nonunion as it showed high percentage of healing in our series. We therefore recommend this technique as treatment of choice to treat Scaphoid non-union.

Keywords: Bone graft, Matti-Russe, Nonunion, Scaphoid.

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INTRODUCTION

Scaphoid is the most commonly fractured carpal bone and accounts for almost 70% of the carpal bone fractures.[1,2] Early and appropriate treatment results in healing in majority of patients.[3,4] However 10-15% of Scaphoid fractures will progress to nonunion, despite early non operative treatment.[5,6] Displaced fractures and fractures of the proximal pole usually progress to nonunion.[4,6,7] Davis[8] suggested that Scaphoid fractures with more than 3mm displacement at presentation should be treated operatively to prevent nonunion. Displaced Scaphoid fractures can be diagnosed on plain radiographs but the sensitivity of plain radiograph for diagnosing undisplaced Scaphoid fracture is very low and CT scan or MRI is the investigation of choice in such cases.[5,8,9] Late diagnosis or failure of conservative treatment may lead to Scaphoid nonunion.[10] When advanced, it may lead to Scaphoid nonunion advanced collapse (SNAC) resulting in pain, decreased wrist movements and early osteoarthritis.[10,11]

Surgical techniques for the treatment of nonunion Scaphoid include non-vascularized bone grafting and vascularized bone grafting with or without fixation.[12] The original Matti-Russe technique involves bone grafting obtained from iliac crest and placement at the nonunion site in wedge shaped configuration through dorsal (Matti/cancellous auto graft) or volar (Russe/cortical and cancellous auto graft) approach.[13] This technique was named after Hermann Matti and Otto Russe who pioneered this technique in 1937 and 1960 respectively.[14] Modified Matti-Russi technique involves harvesting the bone graft from ipsilateral distal radius. This technique utilizes single volar incision using regional or general anaesthesia and has been shown to consume less operative time, preserve the blood supply of Scaphoid, better visualization of nonunion site and no donor site morbidity.1 Matti-Russe technique avoids

metallic fixation resulting in minimal risk of infection and no need of second surgery for removal of fixation material.[15] Studies have shown that Matti-Russe technique has been effective in achieving healing in 80 to 100% cases of nonunion Scaphoid.[16-18]

The objective of our study was to determine the radiological outcome of Scaphoid nonunion treated with modified Matti-Russe technique. To our knowledge this was the first study on this topic in Pakistan. Our results will help to formulate guidelines for treating Scaphoid nonunion in our institution.

METHODS

We conducted this descriptive study in Department of Orthopedics Khyber teaching hospital Peshawar from 23rd June 2017 to 23rd June 2020.Patients of either gender and all ages with scaphoid non-unions presented to Orthopaedic OPD of our hospital were included in our study. Scaphoid nonunion was defined as non-healing fracture of more than 12 weeks duration and confirmed on plain radiographs and CT scan by visualizing fracture lines.[19] Patients with humpback deformity, osteoarthritis, avascular necrosis and previous surgery were excluded from our study. The study was approved by Ethical Review Committee of our hospital and informed written consent for surgery and publication of the results were obtained from all participants of our study. In the included subjects complete history, physical examination and relevant radiographic (wrist radiographs, CT scan, MRI) and biochemical investigations were ordered.

Surgical Technique

All patients of Scaphoid nonunion were treated with modified Matti-Russe technique. The surgery was performed under general anesthesia and tourniquet control. Pre-operative prophylactic antibiotics (injection Cefuroxime 1.5 gm) was administered to all patients before tourniquet inflation. A uniform standard procedure was adopted for all cases. All surgeries were performed by the same team. Palmer approach was used with 4 to 6 cm incision over the flexor carpi radialis tendon. (Fig A to E) Approach was made between flexor carpi radialis tendon and radial artery. The joint capsule was longitudinally incised and Radio-Scapho-Capitate and Radio-Lunate ligaments were retracted or divided to visualized Scaphoid non-union. Fracture site was exposed and curated till bleeding bone was visible. An oval shaped cavity was made with a small osteotomy to accommodate the bone graft. Cortico-cancellous bone graft was taken from ipsilateral distal radius and placed in the nonunion site. Scaphoid fracture reduction and height maintenance was checked under image intensifier. Palmar ligaments and joint capsule was repaired. Tourniquet was deflated before wound closure. Hemostasis was secured and wound was closed. Post operative intra venous antibiotics were discontinued after 48 hours. Scaphoid cast was applied for 6 weeks postoperatively followed by thumb abduction splint for another 6 weeks. X-rays were done on first post-operative day, at 3rd week, 6th week and then every 4th week till 24th week. Bone healing was confirmed by the disappearance of fracture lines and remodeling of the bone graft on radiographs in OPD by an Orthopaedic consultant who was not part of our study team. All patients were advised supervised physiotherapy protocol which consists of shoulder, elbow and finger exercises during the immobilization period followed by active range of motion exercises of the forearm and wrist. All patients resumed heavy manual work once adequate range of motion was achieved and muscle strength restored.

We analyzed our study data with the help of SPSS version 22. Important qualitative variables like gender, side of fracture and cause of fracture was represented as frequency and percentage while quantitative variables like age and healing time was represented as mean and standard deviation.

RESULTS

We operated 16 patients of Scaphoid non-union with modified Matti-Russe technique of bone grafting. Majority (87.5%,n=14) of our study participants were male while only 2(12.5%) patients were female. Mean age of our patients was 32.5±5.87 years. Right sided Scaphoid non-union was present in 10(62.5%) patients and left in 6(37.5%) patients. Dominant hand was involved in 11(68.75%) patients while 5(31.25%) patients had non-dominant hand involved. Road traffic accident was responsible for initial Scaphoid fracture in 12(75%) patients, fall from tree in 2(12.5%) and fall from height in 2(12.5%) patients. Scaphoid waist fracture non-union was noted in 10(62.5%) patients and distal pole in 6(37.5%) patients. Mean time since fracture at presentation was 17 ±4.49 weeks (range 12 to 18.3 weeks). Majority (56.2%, n=9) of patients had non-union Scaphoid due to failed conservative treatment while 7 (43.75%) were treated by traditional bone setters. Post operatively all patients achieved radiological union. The mean union time was 15±2.5 weeks (range 13.4 to 16

weeks).Minimum follow up period was 24 weeks. No patient was lost to follow up. No nonunion, malunion, loss of scaphoid height, osteoarthritis and infection was noted in our series.

DISCUSSION

In our study radiological union was noted in all patients who were treated for Scaphoid nonunion with modified Matti-Russe technique of bone grafting. In an attempt to find optimal treatment for Scaphoid nonunion Pinder and colleague[20] conducted a systematic review utilizing the clinical records of 1,602 patients and 48 publications. They documented union rates of 90% in patients treated with vascularized bone graft while union rates of 89% and 88% were documented in patients who were treated with non-vascularized bone grafts harvested from distal radius and iliac crest respectively. Mean time of union in vascularized bone grafting was 13.8 weeks and in non-vascularized bone graft it was 13.6 weeks. These authors concluded that no superior technique of treatment for Scaphoid nonunion could be found in literature and large scale multicenter randomized studies would be helpful for consensus.

Zarezadeh and Moezi[21] treated 30 patients of Scaphoid nonunion with modified Matti-Russe technique and noted union rate of 86.7%(n=26) and nonunion rate of 13.3%(n=4) at six months follow up. These authors noted that patients with avascular necrosis had less chances of union than those with no avascular nonunion(*P* value 0.004).In our study however, we had excluded patients with nonunion and avascular necrosis of Scaphoid. Andreoletti[4] treated 16 patients of nonunion Scaphoid with modified Matti-Russe bone grafting technique and achieved union in 14(87.5%) patients at 4.9 months post operatively. Zoubos[1] treated 23 patients with modified Matti-Russe technique and reported union rate of 91.3%(n=21) at five year follow up. The author documented radio scaphoid arthritis in 2(8.6%) patients at 2.5 years follow up. This study however treated nonunion on an average 2.5 years after sustaining the fracture and therefore recommend modified Matti-Russu technique for neglected Scaphoid nonunion of longer duration. In our study mean time since fracture at presentation was 17 ±4.49 weeks and duration of follow up was short(24 weeks) and we had not noted any signs of osteoarthritis.

Studies have reported two limitations of Matti-Russe technique namely nonunion of Scaphoid with humpback deformity[22] and non-union with avascular necrosis of the proximal fragment.[23] Although both of these conditions were excluded from our study studies however, had shown that union rates in proximal pole avascular nonunion could not be improved significantly even with vascularized bone grafts.[24]

One disadvantage of modified Matti-Russe technique could be the post-operative prolonged immobilization which is not usually tolerated by most of our patients.[25]On the contrary treatment of Scaphoid nonunion with supplementary fixation avoids prolonged post-operative immobilization.[26]

Small sample size, short follow up and lack of assessment of functional outcome were the limitations of our study. We therefore recommend further studies addressing all these limitations so that our results are validated.

CONCLUSION

Modified Matti-Russe technique is a reliable option for the treatment of Scaphoid nonunion as it showed high percentage of healing in our series. We therefore recommend this technique as treatment of choice to treat Scaphoid non-union.

Conflict of Interest: None

Grants/Funding: None

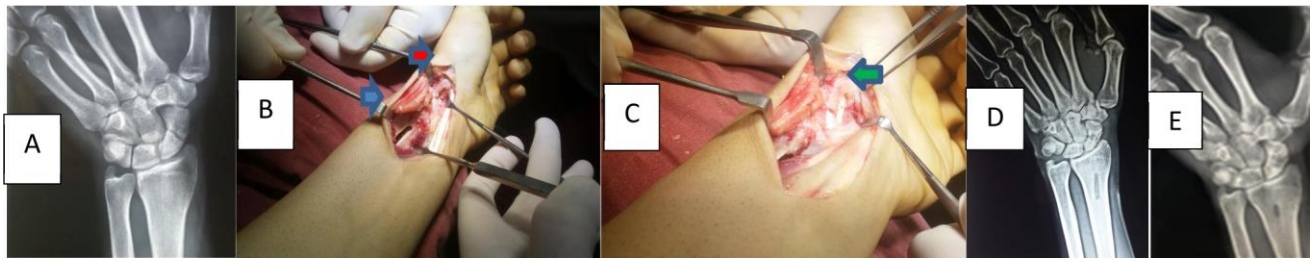

Fig A: Pre op X ray showing Scaphoid non-union.
Fig B: Photograph showing donor site in distal radius (blue arrow), and trough made in scaphoid (red arrow).
Fig C: Photograph showing bone graft placed in Scaphoid nonunion site (green arrow).

Fig D: X ray showing graft placed in scaphoid.
Fig E: Post op X Ray showing healed scaphoid.

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