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Radiological outcome of scaphoid nonunion treated with modified Matti-Russe technique

Muhammad Saqib

Assistant professor Gajju Khan Medical College Swabi

Shakir Ullah

Senior Registrar Bacha khan Medical complex

Corresponding author email: shakirshilmani@gmail.com

Muhammad Salman

Assistant Professor Orthopaedics, LRH-MTI, Peshawar

Muhammed Imran Khan

Assistant professor orthopaedic Khyber teaching hospital Peshawar

Faryall Sharifullah

Maxillofacial Surgeon HMC Peshawar

Abstract--Objective: this study was conducted to find out the Radiological Outcome of Scaphoid Nonunion treated with modified Matti-Russe Technique. Materials and methods; this study was carried out at the Orthopedics department Bacha khan Medical complex from January 2020 to January 2021. Participants in our research consisted of all age groups and genders with scaphoid non-unions who came to our hospital's orthopedic outpatient department. Results A total of 20 patients of Scaphoid non-union were surgically treated through modified Matti-Russe procedure of bone grafting. Out of which male were 17(85%) females were 3(15%). Right sided Scaphoid non-union was examined in 12(60%) patients and left in 8(40%) individuals . Dominant hand was investigated in 14(70%) whereas 6(30%) participants had non-dominant hand. The most prevalent factor for Scaphoid fracture was Road traffic accident 14(70%) followed by fall from tree 4(20%) and fall from height in 2(10%). Scaphoid waist fracture nonunion was observed in 13(65%) individuals and distal pole in 7(35%) individuals. The average duration since fracture at the time of presentation was 17 ±4.49 weeks, with a range of 12 to 18.3 weeks. At the time of presentation, the mean period since fracture was 17 ±4.49 weeks, with a range of 12 to 18.3 weeks. Following surgery, every patient attained radiological union. The union duration ranged from 13.4 to

16 weeks, with an average of 15 ± 2.5 weeks. No main problem detected. Conclusion Modified The Matti-Russe procedure is a reputable therapeutic option for nonunion of the Scaphoid and demonstrated a significant percentage of recovery in our sequence. As a result, we suggest using this method as the first choice for treating Scaphoid non-union

Keywords---bone graft, Matti-Russe, nonunion, scaphoid.

Introduction

The most frequent fracture of the carpal bones is the scaphoid that is responsible for over 70% of carpal bone fractures.(1,2) Most patients recover when they get early and proper therapy.(3,4) Nevertheless, even with early non-operative treatment, ten to fifteen percent of scaphoid fractures will result in nonunion.(5,6) Nonunion is typically the outcome of proximal pole and displaced fractures.(7) According to Davis surgical intervention is recommended for scaphoid fractures with a displacement of greater than 3 mm at presentation in order to prevent nonunion.(8) Plain radiographs can be used to diagnose displaced Scaphoid fractures, however they are not particularly sensitive in identifying displaced Scaphoid fractures. In these situations, an MRI or CT scan is the preferred diagnostic method. (9) A delayed diagnosis or ineffective conservative therapy might result in nonunion of the scapula.(10) If left untreated, it can progress to Scaphoid nonunion advanced collapse (SNAC), which can cause discomfort, reduced wrist mobility, and early osteoarthritis.(11) Surgical methods for treating nonunion Scaphoid include bone grafting that is vascularized and non-vascularized, either with or without fixation.(12) The original Matti-Russe procedure uses a volar (Russe/cortical and cancellous auto graft) or dorsal (Matti/cancellous auto graft) approach to insert bone grafting from the iliac crest at the nonunion site in a wedge-shaped configuration.(13) This method has the names of the two people who invented it, Hermann Matti and Otto Russe, in 1937 and 1960, respectively.(14) The bone graft for the modified Matti-Russi method is taken from the ipsilateral distal radius. This method, which uses a single volar incision under regional or general anesthesia, has been demonstrated to save operating time, protect the scaphoid blood supply, improve visualization of the nonunion site, and have no donor site morbidity. By avoiding metallic fixation, the Matti-Russe approach reduces the danger of infection and eliminates the need for a second procedure to remove the fixation material. (15) Research indicates that the MattiRusse approach has demonstrated efficacy in 80–100% of nonunion Scaphoid instances for healing. (16) Our study's goal was to identify the radiological result of treating scaphoid nonunion using a modified Matti-Russe approach.

Materials and Methods

This study was carried out at the Orthopedics department Bacha khan Medical complex from January 2020 to January 2021. Participants in our research consisted of all age groups and genders with scaphoid non-unions who came to our hospital's orthopedic outpatient department. The definition of scaphoid

nonunion was described as a non-healing fracture lasting more than 12 weeks. The condition was verified by seeing fracture lines on plain radiographs and a CT scan. We excluded patients with avascular necrosis, osteoarthritis, humpback deformity, or history of surgery in our analysis. The Ethical Review Committee of our hospital accepted the study, and all of the participants gave their informed written consent for surgery and the publication of the study's findings. Complete history, physical examination, pertinent radiographic (wrist radiography, CT scan, MRI), and biochemical tests were ordered for the included participants.

Surgical Technique

Treatment for all patients with Scaphoid nonunion used a modified Matti-Russe method. Under general anesthesia and tourniquet control, the procedure was carried out. All patients administered injectable Cefuroxime 1.5 gm as preoperative prophylactic antibiotics prior to tourniquet inflation. For each scenario, a consistent, standard operating method was used. The same team conducted all of the procedures. Using the Palmer technique, an incision of 4 to 6 cm was made over the flexor carpi radialis tendon. (Fig A-E) The flexor carpi radialis tendon and the radial artery were examined. To visualize Scaphoid nonunion, the joint capsule was longitudinally punctured, and the Radio-Scapho-Capitate and Radio-Lunate ligaments were retracted or split. The fracture site was cleaned and examined until the bleeding bone was seen. To accommodate the bone transplant, a minor osteotomy was used to create an oval-shaped hollow. An ipsilateral distal radius cortico-cancellous bone graft was inserted into the nonunion site. The reduction of scaphoid fractures and the preservation of height were examined using an image intensifier. The joint capsule and palmar ligaments were fixed. Before the incision was closed, the tourniquet was deflated. The wound was sealed and hemostasis was ensured. After 48 hours, post-operative intravenous antibiotics were stopped. After surgery, a scaphoid cast was placed for six weeks, and then a thumb abduction splint for an additional six weeks. X-rays were taken on the first post-operative day, three weeks, six weeks, and then every four weeks until the twenty-fourth week. An orthopedic specialist who was not a member of our study team verified that bone healing had occurred when fracture lines disappeared and the bone graft on radiographs in the outpatient department remodeled. Every patient was given instructions for a supervised physical therapy regimen that includes active range-of-motion exercises for the wrist and forearm after the immobilization phase, as well as activities for the shoulder, elbow, and fingers. Once they had recovered enough muscular strength and range of motion, all patients were able to resume strenuous physical labour. We used SPSS version 22 to analyze the data from our research. Quantitative data including age and healing time was expressed as average and standard deviation, whereas gender, the side of the fracture, and the cause of the fracture were represented as frequency and percentage.

Results

A total of 20 patients of Scaphoid non-union were surgically treated through modified Matti-Russe procedure of bone grafting. Out of which male were 17(85%) females were 3(15%).Our patients' average age was 32.5 ± 5.88 years (Fig 1). Right sided Scaphoid non-union was examined in 12(60%) patients and left in

8(40%) individuals. Dominant hand was investigated in 14(70%) whereas 6(30%) participants had non-dominant hand. The most prevalent factor for Scaphoid fracture was Road traffic accident 14(70%) followed by fall from tree 4(20%) and fall from height in 2(10%) individuals as shown in factors responsible for scaphoid has presented in table 1. Scaphoid waist fracture nonunion was observed in 13(65%) individuals and distal pole in 7(35%) individuals. The average duration since fracture at the time of presentation was 17 ± 4.49 weeks, with a range of 12 to 18.3 weeks. The majority of patients 9(45%) had non-union Scaphoid as a result of conservative treatment failing, whereas 7 (35%) had standard bone setter care. Following surgery, every patient attained radiological union. The union time ranged from 13.4 to 16 weeks, with a mean of 15 ± 2.5 weeks. A minimum of 24 weeks were spent in follow-up. Nobody was overlooked for follow-up. Absence of osteoarthritis, infection, scaphoid height decrease, nonunion, and malunion as seen in our series.

Discussion

In all of the patients in our research receiving treatment for scaphoid nonunion using the modified Matti-Russe bone grafting technique, radiological union was seen. An effort to determine the best course of care for Scaphoid nonunion A systematic study was carried out by Pinder and a colleague (20) using 48 publications and the clinical information of 1,602 individuals. They recorded 90% union rates for patients treated with vascularized bone grafts, and 89% and 88% union rates for patients treated with non-vascularized bone grafts taken from the iliac crest and distal radius, respectively. The mean union time for vascularized bone grafting was 13.8 weeks, while the mean union time for non-vascularized bone grafting was 13.6 weeks. These authors came to the conclusion that there was no better treatment method for scaphoid nonunion in the literature, and that large-scale multicenter randomized trials would be beneficial. With a modified Matti-Russe approach, Arezadeh and Moezi (21) treated 30 patients with Scaphoid nonunion, noting a union percentage of 86.7% (n=26) and a nonunion rate of 13.3% (n=4) at the six-month follow-up. According to these authors, individuals with avascular necrosis had a lower likelihood of union than those without avascular nonunion (P value = 0.004). However, individuals with nonunion and avascular necrosis of the Scaphoid were not included in our research. Using a modified Matti-Russe bone grafting approach, Andreoletti (22) treated 16 nonunion Scaphoid patients, and at 4.9 months after surgery, 14 (87.5%) of the patients had union. Using a modified Matti-Russe approach, treated 23 patients, reporting a 91.3% union rate (n=21) at the five-year follow-up. At a 2.5-year follow-up, the author reported radio scaphoid arthritis in 2 (8.6%) of the patients. However, the nonunion in this research was treated an average of 2.5 years after the fracture, and as a result, the modified Matti-Ruse approach is advised for ignored Scaphoid nonunion of longer length. The study found that the average time after fracture at presentation was 17 ± 4.49 weeks, the follow-up period was brief (24 weeks), and no osteoarthritis symptoms were seen. Two drawbacks of the MattiRusse approach have been documented in studies: nonunion of the scaphoid with humpback deformity (22) and nonunion with avascular necrosis of the closest fragment.(23) Even with vascularized bone grafts, union rates in proximal pole avascular nonunion could not be considerably improved, despite the fact that both of these diseases were not included in our analysis.(24) One

drawback of the modified Matti-Russe approach would be the extended immobilization that follows surgery, which most of our patients often cannot bear.(25) Conversely, using additional fixation to treat Scaphoid nonunion prevents extended post-operative immobilization.(26). The short follow-up period, the limited sample size, and the absence of functional outcome evaluation were the study's limitations. In order to confirm our results, we thus advise doing more research that addresses each of these limits.

Conclusion

Modified The Matti-Russe procedure is a reputable therapeutic option for nonunion of the Scaphoid and demonstrated a significant percentage of recovery in our sequence. As a result, we suggest using this method as the first choice for treating Scaphoid non-union.

Table 1 factors responsible for Scaphoid non-union in the study n =20

Cause	N = 20	%
Road traffic accident	14	70
Fall from tree	4	20
Fall from height	2	10
Total	20	100

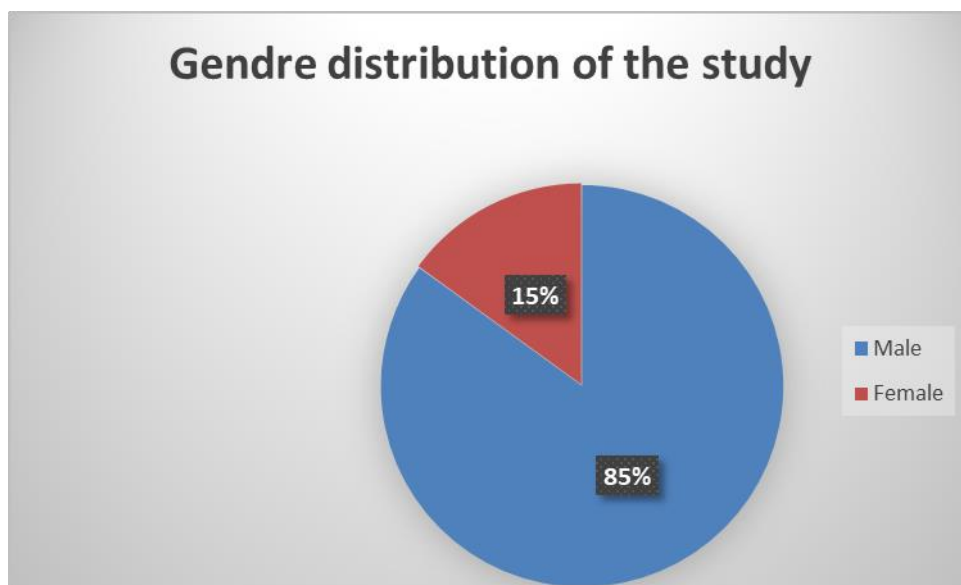


Fig A: Pre op X ray viewing Scaphoid non-union.

Fig B: Photograph screening donor site in distal radius (blue arrow), and trough made in scaphoid (red arrow).

Fig C: Photograph display bone graft placed in Scaphoid nonunion site (green arrow).

References

1. Zoubos AB, Triantafyllopoulos IK, Babis GC, Soucacos PN. A modified Matti-Russe technique for the treatment of scaphoid waist non-union and pseud arthritis. *Med Sic Monit.* 2011; 17(2):7-12.
2. Wolf JM, Dawson L, Mountcastle SB, Owens BD: The incidence of scaphoid fracture in a military population. *Injury.* 2009; 40(12):1316-19.
3. Brondum V, Larsen CF, Skov O Fracture of the carpal scaphoid: frequency and distribution in a well-defined-population. *Eur J Radiol.*1992; 15(2): 118-22.
4. Andreoletti, Moharamzadeh AD, Molisani D, Piarulli G, Grismondi CE. Treatment of Scaphoid Waist Non-Union with A Modified Matti-Russe Technique: Our Experience Giuseppe. *Biomed J Sci & Tech Res.*2017; 1(3):743-747.
5. Hovius SE, de Jong T. Bone Grafts for Scaphoid Nonunion: An Overview. *Hand surgery.* 2015;20(2):22-227..
6. Ryan GM. Fractures and non-unions of the scaphoid. *J Okla State Med Assoc.* 1996; 89(9):31523.
7. Steinmann SP, Adams JE. Scaphoid fractures and nonunions. Diagnosis and treatment. *Journal of Orthopaedic Science.* 2006; 11(4):424-31.
8. Davis TR. Prediction of outcome of nonoperative treatment of acute scaphoid waist fracture. *Ann R Coll Surg Engl.* 2013;95(3):171-6.
9. Lee SK, Byun DJ, Roman-Deynes JL, Model Z, Wolfe SW. Hybrid Russe procedure for scaphoid waist fracture nonunion with deformity. *J Hand Surg.*2015; 40(11):2198-205.
10. Bhat M, McCarthy M, Davis TR, Oni JA, Dawson S. MRI and plain radiography in the assessment of displaced fractures of the waist of the carpal scaphoid. *J Bone Joint Surg Br.* 2004;86(5):705-13.
11. Leung YF, Ip SP, Cheuk C, Sheung KT, Wai YL. Trephine bonegrafting technique for the treatment of scaphoid nonunion. *J Hand Surg Am.* 2001;26(5):893-900.
12. Kawamura K, Chung KC. Treatment of Scaphoid Fractures and Nonunions. *J Hand Surg Am.* 2008;33(6): 988-997.
13. Raju PK, Kini SG. Fixation techniques for nonunion of the scaphoid. *J Orthop Surg (HongKong).* 2011;19 (1): 80-4.
14. Russe O. Fracture of the carpal navicular:Diagnosis, non-operative treatment, and operative treatment. *J Bone Joint Surg Am.* 1998;42-A: 759-68.
15. Jiranek WA, Ruby LK, Millender LB, BankoffMS, Newberg AH. Long-term results after Russe bone grafting: the effect of malunion of the scaphoid. *J Bone Joint Surg Am.* 1992; 74:1217-28.
16. Stark A, Brostrom LA, Svartengren G. Scaphoid nonunion treated with Matti-Russe technique. Long-term results. *Clin Orth.*1987; 14:175-80.
17. Hooning van Duyvenbode JF, Keijser LC, Hauet EJ, Obermann WR, Rozing PM. Pseudoarthrosis of the scaphoid treated by the Matti-Russe

- operation.. A long-term review of 77 cases. *J Bone Joint Surg Br.*1991; 73:603-6.
18. Dustmann M, Bajinski R, Tripp, A, Gulke J,Wacher N. A modified Matti-Russe technique of grafting scaphoid non-unions. *Arch Orthop Trauma Surg.*2017; 137, 867-873.
 19. Ammori MB, Elvey M, Mahmoud SS, Nicholls AJ, Robinson S, Rowan C. The outcome of bone graft surgery for nonunion of fractures of the scaphoid. *Epub.*2019;44(7):676-684.
 20. Pinder RM, Brkljac M, Rix L, Muir L, Brewster Treatment of Scaphoid Nonunion: A Systematic Review of the Existing Evidence. *J Hand Surg Am.* 2015;40(9):1797-1805.
 21. Zarezadeh A, Moezi M, Rastegar S, MotifardM, Foladi A, Daneshpajouhnejad P. Scaphoid Nonunion fracture and results of the modified Matti-Russe technique. *Adv Biomed Res.* 2015;4:39:551-55.
 22. Waitayawinyu T, Pfaeffle HJ, McCallister WV, Nemecek NM, Trumble TE Management of scaphoid nonunions. *Hand Clin.* 2010; 26(1):105-17.
 23. Waitayawinyu T, McCallister WV, Katolik LI, Schlenker JD, Trumble TE Outcome after vascularized bone grafting of scaphoid nonunions with avascular necrosis. *J Hand Surg Am.* 2009;34(3):387-94.
 24. Straw RG, Davis TR, Dias J. Scaphoid nonunion: Treatment with a pedicled vascularized bonegraft based on the 1,2 inter compartmental supra retinacula branch of the radial artery. *J Hand Surg Br.* 2002; 27(5):413-416.
 25. Stark A, Brostrom LA, Svartengren G. Scaphoid nonunion treated with the Matti-Russe technique. Long-term results. *Clin Orthop Relat Res.*1987; (214):175-80.
 26. Parkinson RW, Hodgkinson JP, Hargadon EJ. Symptomatic non-union of the carpal scaphoid: Matti-Russe bone grafting versus Herbert screw fixation. *Injury.*1989; 20(3):164-6