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INTRODUCTION

Lunatomalacia or Keinbock's disease is an avascular, aseptic necrosis of the carpal bone lunate ultimately leading to collapse of the carpal bones and wrist osteoarthritis. The exact aetiology of the disease is unknown.^{1,2,3} In 1910, an Austrian radiologist Robert Keinbock suggested that traumatic rupture of perilunate ligaments and vessels result in necrosis and collapse of the corpus.^{4,5} It is a rare disease with a prevalence of less than 5 percent per 10,000 population.⁶ It usually affects manual labourers in their second and fourth decades and the typical presentation is unilateral.^{7,8} The disease is characterized by nonspecific symptoms initially and include wrist

KEINBOCK'S DISEASE; METAPHYSEAL CORE DECOMPRESSION OF DISTAL RADIUS-A NOVEL TECHNIQUE TO TREAT

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ABSTRACT... Objectives: To evaluate the functional and radiological outcome of metaphyseal core decompression of distal radius for treating Keinbock's disease. **Study Design:** Descriptive case series. **Place and Duration:** Orthopaedic A Unit Lady Reading Hospital Peshawar and Ghurki Trust Teaching Hospital, Lahore and District Headquarter Hospital Temargarah Lower Dir from January 2014 to June 2016. **Material and Methods:** Patients of all ages and both gender with pain and restricted wrist motion and radiologically diagnosed Lichtman's stage I, II and III (A) were included in the study. Metaphyseal core decompression of distal radius was performed in the included subjects and patients were followed fortnightly for two months and then monthly for at least one year. At each visit pain was assessed with Visual Analogue Scale (VAS), wrist flexion and extension measured with goniometer and Stahl index with x ray wrist. **Results:** A total of eleven patients including 9(81.8%) males and 2(18.1%) females with mean age 31.2 years (range 24 to 42 years) were included in the study. Lichtman's stage I patients were 2(18.1%), stage II were 6(54.5%) while stage III (A) patients were 3(27.2%). Post operatively complete pain relief was achieved (VAS 0) for all stage I and II and most stage III (A) patients (90.9%, n=10) while mild pain (VAS 1) was reported in one (9%) patient of stage III (A) disease at final visit. Normal wrist flexion and extension was achieved in all stage I and II and most of stage III (A) patients (90.9%). Only one (9 %) patient of stage III (A) could not achieve adequate wrist mobility at last follow up. Pre and post op Stahl index remained the same for all stages. No complication was reported. **Conclusion:** Metaphyseal core decompression of distal radius results in excellent functional outcome in majority patients and should be the treatment of choice for early Keinbock's disease (stage I'II and III (A)).

Key words: Keinbock's disease, Lichtman's tagging, Lunate, Core decompression

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pain, swelling and decrease wrist movements.⁹ The Lichtman's radiographic staging system is commonly used for classifying as well as a guide for treating the Keinbock's disease.¹⁰

Traditionally treatment options for Keinbock's disease Lichtman's stage I,II and III(A) are conservative wrist immobilization¹¹, vascularized bone grafting¹² radial shortening¹³ and ulnarlengthening¹⁴ while stage III(B) and IV are treated with salvage procedures like proximal row carpectomy¹⁵ carpal bone arthrodesis^{16,17} and wrist arthrodesis.¹¹ However, the best treatment option is still controversial.^{18,19} Illarramendi and Pablo De Carli²⁰ presumed that commonly

used traditional surgical procedures of radial shortening or ulnar lengthening for treating stage I,II and III(A) Keinbock's disease actually decompresses the distal radius and ulna causing reactive hyperemia and thus enhancing the re-vascularization of the lunate. Based upon this assumption they developed a technique called Metaphyseal Core Decompression (MCD) of distal radius and ulna for the treatment of Stage I,II and III(A) and consisted of curettage of the distal radius and ulna through a small window in the distal cortex. The procedure is technically easy, does not violate the wrist joint nor any implant needed for fixation and gives excellent results post operatively.²⁰

This study was designed to evaluate the functional and radiological outcome of metaphyseal core decompression for Keinbock's disease in our set up and to our knowledge this is the first study on this topic in Pakistan and we hope that this would encourage other researchers to conduct large scale and controlled studies on this topic.

MATERIAL & METHODS

This study was conducted simultaneously in Orthopaedic unit A Lady Reading Hospital Peshawar and Orthopaedic Unit of Ghurki Trust Teaching Hospital Lahore and District Headquarter Hospital Temargarah Lower Dir from January 2014 to June 2016. Patients of both gender and all ages with wrist pain and restricted movements and with Lichtman's stage I¹⁰ (shape and density of the lunate normal on plain radiograph and MRI was used for confirmation), stage II(shape of lunate normal but increased in density) and stage III (A)-collapse of lunate without scaphoid rotation and radioscapoid angle less than 60 degrees, admitted from Out Patient Department (OPD) were included in the study. Patient's of Lichtman's stage III (B), stage IV, rheumatoid arthritis and those having wrist or hand surgery or fractures wrist were excluded from the study. The study protocols were approved by the ethical committees of the respective hospitals. In the included subjects informed written consent was taken and history and complete physical examination was carried out. X-ray wrist AP and

lateral was done for Lichtman's stage II and III (A) while MRI was done in case of stage I disease. Preoperative wrist flexion and extension was measured with goniometer while pain was rated with Visual Analogue Scale (VAS) from 0(no pain) to 10(worst pain ever experienced). Pre-operative Stahl Index⁴ (Height of lunate on x-ray lateral view/width of lunate on x-ray lateral view) was determined.

Operative Technique

The metaphyseal decompression of distal radius was performed under general anaesthesia in supine position and under pneumatic tourniquet. The distal radius was approached through a 4 cm longitudinal incision just proximal to radial styloid. Extensor tendons were retracted and periosteum incised after elevation. With osteotome a small bone window of two centimeter was made and distal radial metaphysis was curetted and left inside. The bony cortex was replaced over the window and skin closed without periosteum closure. We did not perform ulnar metaphyseal decompression in our study. Post operatively below elbow plaster slab was applied. Patients were given anti-inflammatory drugs and discharged home the other day. Slab and skin stitches were removed at two weeks and range of motion allowed. Patients were advised to avoid heavy manual work for six weeks. All patients were reviewed fortnightly for two months and then monthly for one year. At final follow up visit pain was rated on VAS while wrist flexion and extension was measured on goniometer. Stahl index was determined on plain x-ray wrist. Data was entered into SPSS (version 20). Frequencies and percentages were calculated. Data represented in table where necessary.

RESULTS

A total of eleven patients including 9(81.8%) males and 2(18.1%) females with mean age 31.2 years (range 24 to 42 years) were included in the study. Right wrist was involved in 8(72.7%) while left was involved in 3(27.2%) patients. Majority (81.8%, n=9) of the patients have involvement of the dominant hand while non-dominant hand was involved in 2(18.1%) patients. Lichtman's stage I

patients were 2(18.1%), stage II were 6(54.5%) while stage III (A) patients were 3(27.2%). By profession 2 patients were school teachers, 4 were manual labourers, 2 were students, 1 was jobless while 2 patients were housewives. Minor trauma to the affected wrists were reported in 4(36.3%) patients while in 7(63.6%) patients gave no history of trauma. All the patients have taken nonsteroidal anti-inflammatory drugs for their disease but only two (18.1%) patients were diagnosed as Keinbock's disease, both

stage II(A) by the treating orthopaedic surgeons and were referred to our hospital for treatment while majority(81.8%,n=9) were diagnosed as Keinbock's disease in our Out Patient Department(OPD). Pain and restricted wrist movements were present for an average duration of 12 weeks (range 8 to 13 weeks). Mean operative time was 35 minutes(range 20 to 45 minutes).The preop and post-operative assessment results at one year follow up are shown in Table-I.

Sr. No	Outcome Parameters	Lichtman's stage I		Lichtman's stage II		Lichtman's stage III(A)	
		Pre-op	Post-op	Pre-op	Post-op	Pre-op	Post-op
1.	Visual Analogue Score(VAS)	6	0	7	0	8	1
2.	Wrist Flexion(degrees)	60	75	57	67	55	63
3.	Wrist extension(degrees)	55	70	52	65	50	60
4.	Stahl index	0.5	0.56	0.51	0.51	0.43	0.43

Table-I. Pre op and post op functional and radiological outcome of all patients

The pain relief was the earliest outcome after metaphyseal core decompression and VAS improved from a mean of 5 to 2 at 4th week post operatively for all stages while complete pain relief was achieved (VAS 0) for all stage I and II and majority stage III (A) patients (90.9%, n=10) while mild pain (VAS 1) was reported in one (9%) patient of stage III (A) disease at final visit. A greater degree of functional improvements in terms of wrist flexion and extension was reported for Lichtman's stage I and stage II disease (15 degrees of improvements of flexion and extension for stage I while 10 and 13 degrees gain in flexion and extension for stage II respectively) at final follow up evaluation of patients after one year. Only one patient of stage III (A) could not achieve adequate wrist mobility at last follow up. Radiographically Stahl index of all the patients remained the same both pre and postoperatively although stage III (A) patients had the lowest Stahl index than stage I and II disease. No complication both pre operatively and post operatively had been reported. All the patients (except one) were fully satisfied with the procedure and returned to

their pre injury profession.

DISCUSSION

We have treated eleven patients of early Keinbock's disease [stage I, II and III(A)] with distal radius metaphyseal core decompression and dramatic pain relief was the earliest outcome we recorded (mean VAS 5 decline to 2) at 4th week for majority (90.9%, n=10). This early improvement in VAS post Operatively could be due to decrease in the circulatory pressure inside the lunate affected by ischemia.²¹ Illarramendi²⁰ reported pain relief in 34 of their 48 patients with metaphyseal decompression of radius and ulna both. Sherman and colleagues²² applied axial loads to the upper limbs of seven fresh cadavers and measured the radiocarpal joint pressures before and after distal radial decompression and concluded that although post operatively good clinical results of the procedure for Keinbock's disease had been reported, biomechanically there was no reduction of pressure on the lunate as a result of this procedure. Innes and Strauch²³ searched the literature between 1998 and 2008 for the surgical

outcomes of stage I, stage II, and stage III (A) Keinbock's disease treated with decompression of radial metaphysis, vascularized bone graft and osteotomy of the radius and they concluded that due to the lack of adequate data on the disease no treatment option is found superior than the other in the treatment of Keinbock's disease. In our study we documented a greater degree of wrist flexion and extension for Lichtman's stage I and stage II disease (15 degrees of improvements of flexion and extension for stage I while 10 and 13 degrees gain in flexion and extension for stage II respectively) at final follow up evaluation of patients after one year while only one patient of stage III (A) had unsatisfactory outcome as he could not achieve adequate wrist mobility at last follow up. Illarramendi²⁰ recorded a flexion extension of about 56/60 degrees as compared to contralateral side of 77/78 degrees while grip strength was improved to 75 percent of the contralateral side. They reported unsatisfactory results for only five patients mostly at stage III (A) (3 patients). But the follow up period of their study was 9 years on an average while our follow up period was one year. Radiographical outcome of Stahl index of all the patients remained the same both pre and postoperatively in our study. This is similar to the observations of Illarramendi²⁰ where radiographic staging of majority of patients were unchanged at last followup.

Our sample size of the study was small due to the fact that Keinbock's disease is an uncommon disease. However further long term studied should be carried out on this topic to confirm the usefulness of metaphyseal core decompression for early Keinbock's disease.

CONCLUSION

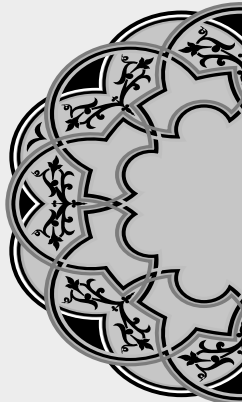
Metaphyseal core decompression of distal radius for Keinbock's disease is a simple surgical procedure with excellent functional results and no complications. It is technically easy and economically feasible to the patient. No implant is needed. No second procedure is required. We recommend it as a first line treatment for early Keinbock's disease (Lichtman's stage I, II and III (A)).

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*“You have enemies? Good.
That means you’ve stood up for something.
Sometime is your life.”*

Churchill

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