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CASE REPORT

A Case study on the Treatment of Severe Displacement of the Thumb Carpometacarpal Joints

Estudio de caso sobre el tratamiento del desplazamiento grave de las articulaciones carpometacarpianas del pulgar

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ABSTRACT

Severe disability might result from a chronic carpometacarpal (CMC) dislocation. Displacement of the pollex's CMC joint is a rather rare damage. The anterior oblique ligament (AOL) has historically been the focus of surgical surgery, but more lately, the dorsoradial ligament (DRL) has drawn greater attention. Both ligaments must be considered to get the optimum functional outcomes during CMC joint rehabilitation. The purpose of this research was to examine the treatment of a case with severe dislocation of the thumb CMC joints. Following a motorbike accident, a 34-year-old man came with acute discomfort in his left hand. The diagnosis is that the man had many second to fifth CMC joint fracture-dislocations. Under general anesthesia, man had successful closure reduction and numerous Kirshner wire (K-wire) fixation. Excellent clinical outcomes tore verified after a one-year follow-up. Nonetheless, it includes the proportion of patient average mean value, loss of reduction, DASH score, Numeric rating scale (NSR), grip strength. For all dislocations of the CMC joint, it is advisable to use the closed reduction. To get a stable fixation and fantastic outcomes, K-wire fixation maybe incorporated. Acute or subacute thumb CMC joint displacement may be cured by fixing the dorsoradial muscle and anchoring it. Rarely do CMC fracture-dislocations include several bones. For a precise diagnosis, simple radiography and clinical exams are required. It is common practice to treat fractures and dislocations. Successful in the instance was a straightforward closed reduction with K-wires repair.

Keywords: Spinal Dural Arteriovenous Fistula; Medical Records; Radiograph; Surgical Repair; Fluorescence Angiography.

RESUMEN

Una luxación crónica de la articulación carpometacarpiana (CMC) puede provocar una discapacidad grave. El desplazamiento de la articulación CMC del pulgar es una lesión bastante poco frecuente. El ligamento oblicuo anterior (AOL) ha sido históricamente el foco de la cirugía, pero últimamente el ligamento dorsorradial (DRL) ha suscitado un mayor interés. Ambos ligamentos deben tenerse en cuenta para obtener los mejores resultados funcionales durante la rehabilitación de la articulación CMC. El objetivo de esta investigación era

examinar el tratamiento de un caso con luxación grave de las articulaciones CMC del pulgar. Tras un accidente de moto, un hombre de 34 años acudió con molestias agudas en la mano izquierda. El diagnóstico fue que el hombre presentaba numerosas fracturas-luxaciones de la articulación CMC de la segunda a la quinta. Bajo anestesia general, se le practicó con éxito una reducción cerrada y numerosas fijaciones con agujas de Kirshner (agujas K). Se verificaron excelentes resultados clínicos tras un año de seguimiento. No obstante, se incluye la proporción del valor medio del paciente, la pérdida de reducción, la puntuación DASH, la escala de valoración numérica (NSR) y la fuerza de prensión. Para todas las luxaciones de la articulación CMC, es aconsejable utilizar la reducción cerrada. Para obtener una fijación estable y resultados fantásticos, se puede incorporar la fijación con agujas de Kirschner. El desplazamiento agudo o subagudo de la articulación CMC del pulgar se puede curar fijando el músculo dorsorradial y anclándolo. Rara vez las fracturas-luxaciones CMC incluyen varios huesos. Para un diagnóstico preciso, se requieren radiografías simples y exámenes clínicos. Es una práctica común tratar las fracturas y luxaciones. En este caso, el éxito se logró mediante una reducción cerrada sencilla con reparación mediante agujas de Kirschner.

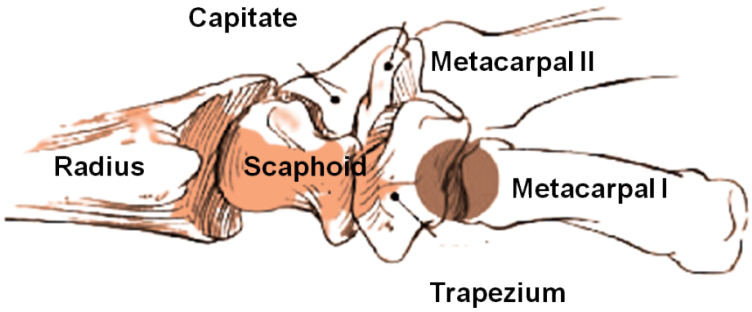
Palabras clave: Fístula Arteriovenosa Dural Espinal; Historiales Médicos; Radiografía; Reparación Quirúrgica; Angiografía por Fluorescencia.

INTRODUCTION

The CMC joint, located close to the base of the thumb, is where the thumb's metacarpal bone joins the wrist. When the thumb CMC joint shifts from its normal position, usually due to arthritis or trauma, this is known as displacement. Pain, edema, and limited thumb mobility are all possible outcomes of CMC joint displacement. The degree of the dislocation and the underlying etiology will determine the course of treatment. When nothing else seems to research, try rest, ice, and physical therapy. Realigning the joint and restoring function may need surgery in more serious situations. Because thumb CMC joint displacement may cause permanent joint injury if ignored, it's crucial to contact a doctor or hand expert as soon as possible if it appears you might have this disease.[1] Isolated thumb less than 1 % of all hand injuries include dislocations of the CMC joint, making them very rare.to restore pinch and grip strength, optimal care is very necessary; yet, there is no consensus about the treatment of these dislocations owing to the dearth of research that has been conducted on the subject of interest.[2] CMC joint dislocations and fractures are uncommon but potentially debilitating injuries to the hand. Because of proximal metacarpal migration, repeated fracture-dislocations of the CMC joint may cause atrophy of the transverse and longitudinal carpal arches, a loss of grip strength, an imbalance of the intrinsic and extrinsic muscles, and a loosening of the extrinsic tendons. Therefore, it is thought that anatomical restoration is crucial. Reduction is essential for reestablishing equilibrium in the muscles and correct mechanics of the hand. Unfortunately, less-than-ideal results often result from the neglect or improper management of such injuries.[3] The thumb has been misplaced. MCP joints often occur after a violent fall that causes the joint to be pushed into hyperextension. Dislocations may range from simple to complex. A dislocation's complexity is determined by the existence of the volar plate, sesamoids, or other soft tissues. While closed reduction may be enough for minor dislocations, therapy necessitates open reduction, either with or without Kirschner wire fixation. Rarely do dislocations occur without trauma. It might be linked to a variety of pathological collagen diseases and benign hypermobility syndrome. These dislocations are often bilateral and are painlessly moved by the patients. Thumb popping backward is a frequent emergency department presentation, and these kids are attention-seeking. To don't worry about them and don't let anything stop them from doing anything. Mothers often relate how their kids have the tendency of repeatedly dislocating their thumbs and then quickly decreasing them. All of these dislocations healed without surgery. Education, activity changes, proprioceptive and strengthening thumb exercises, as toll as protective splints sometimes, are all helpful.[4]

Figure 1 depicts the general structure of the thumb CMC joints. Pain, functional restrictions, subluxation, and strength loss are among the clinical signs of CMC joint instability. The execution of a pinch grasp is most often associated with an aggravation of these symptoms. weak ligaments in the thumb's base joint allow for dorso-radial translation, which is thought to be a major contributor to osteoarthritis (OA). Ligament laxities seem to contribute to joint hypermobility, which in turn contributes to the incidence and severity of CMC 1 OA. The majority of postmenopausal women will get OA of the hand, which is a prevalent genetic ailment. Despite not being a major ailment, this syndrome is connected with a significant amount of morbidity. Reducing the CMC joint and then repairing the trans osseous ligament with a distal pedicle tendon strip from the APL muscle is a relatively new surgical procedure reported to achieve an appropriate degree of joint stability.[5]

After being hit by a heavy item (a hummer) right over the base of his thumb, a 28-year-old male reported according to the research, to the emergency room with an anterolateral subluxation of the trapeziometacarpal joint.[6]



Source: https://www.semanticscholar.org/paper/A-New-Splint-Design-for-the-Thumb-CMC-Joint-Colditz-Koekebakker/284d24dbc7aba216da9314584c47b89adedf9ff9.

Figure 1. General structure of the thumb CMC joints

An uncommon instance of erosive polyarticular tophaceous gout was reported in, in which the patient presented with painless lumps in both hands and had substantial osteolysis on radiography without periarticular osteopenia.[7] Research has reported recurring bilateral CMC joint subluxation and dislocation caused by low-energy processes in a young patient without any discernible connective tissue pathology.[8] The research a case of an ultrasound-diagnosed and ultrasound-monitored locked thumb metacarpophalangeal joint.[9] Ultrasound has the potential to be a helpful diagnostic technique for identifying a locked metacarpophalangeal joint in the thumb and for quickly determining the result of the reduction. Research revealed the findings of a diagnostic ultrasonography, radiographs, and clinical evaluation of a patient who had a type III Salter-Harris fracture of the first proximal phalanx.[10] The diagnostic efficacy of magnetic resonance imaging (MRI), ultrasonography (US), and a clinical examination for identifying displaced and non-displaced ulnar collateral ligament (UCL) tears was compared in the aforementioned research.[11] The research describes the successful surgical treatment of a comminuted trapezium fracture.[12] A 26-year-old woman sustained a comminuted trapezium fracture while driving in this case. According to the research of the Fiji Anchor was evaluated for use in therapy for a ruptured ulnar collateral ligament in the thumb's metacarpophalangeal joint.[13] Research goal was to provide a thorough explanation of the evidence pertaining to the diagnosis and treatment of these lesions, with special emphasis on the quality of the existing data.[14] To will provide recommendations for enhancing the design of future research on these lesions based on the outcome. The research presented a case of chronic damage to both the sagittal band and the metacarpophalangeal collateral ligament.[15] Although surgery would have been the best course of action in the immediate aftermath of the accident, COVID-19 pandemic limits on elective treatments prevented surgical treatment. The radial collateral ligament (RCL) is even less likely to sustain damage than the thumb's metacarpophalangeal (MCP) joint will. An RCL injury and several thumb MCP joint volar dislocations tore reported in a surgical case study.[16] One patient, according to the research, simultaneously suffered several CMC injuries, acute carpal tunnel syndrome, and an open palmar trapezoid fracture-dislocation.[17] The broken bone was badly displaced. An untreated Bennett fracture of the first metacarpal caused repeated post-traumatic trapeziometacarpal dislocation in a 15-year-old boy who presented to the emergency room.[18] According to the research, 1,5-mm variable angle locking hand plates that tore converted into two-hole micro hook plates tore effective in treating two cases of thumb UCL avulsion fractures.[19] The patient in the research was a 40-year-old male who had suffered a dislocation of his little finger's dorsal metacarpophalangeal joint after being in a car accident.[20] Open reduction was used when closed reduction was unsuccessful, as demonstrated by radiographs that sesamoid bone was plainly visible within the joint. Only in very rare instances can entrapped radial sesamoids need open reduction of the MCP joint of the thumb. A subacute dislocation of the MCP joint of the thumb occurred in a 24-year-old lady due to an imprisoned radial sesamoid.[21] A 13-year-old child shows up with a severe thumb injury from sports. Radiographs reveal a slightly displaced intra-articular fracture at the base of the first metacarpal.[22] Doctors had to use the new method of metacarpal fusion from side to side after a bullet entered the teen's right hand.[23] When the proximal right second metacarpal base was traumatized, the trapezium and trapezoid suffered significant injury. The research examined the results of treating recurring UCL injuries with an extensor policies brevis modified Sakellaridis method.[24] To present case studies on the management of severe thumb CMC joint displacement. The clinical state, the reason for the injury, the radiological description, the treatment plan, and the post-operative care are all discussed.

The remaining sections of this analysis are as follows: Part 2 introduces the clinical case presentation. The research results are in part 3. Part 4 contains the discussion. Part 5 contains the conclusion.

CASE REPORT

Severe left- hand trauma evaluation

The 34-year-old male patient, who is left-handed, presented to the emergency department 30 minutes after

a motorbike accident, complaining of severe discomfort in his left hand.[25] His left hand stolled up, hurt, and became misshapen. On his left hand back, where the CMC joints are located, the physical examination revealed large, noticeable bone abnormalities together with noticeable soreness. The man couldn't move his left wrist and was in agonizing pain. On posterior, oblique, and imaging scans, a dorsal dislocation of the second-to-5th CMC joints and a displaced avulsion fracture of the base of the fifth metacarpal bone tore observed.

Diagnostic and preparation for surgery

After deciding to processed with closed reduction of the fracture dislocations using numerous Kirshner wires (K-wire), to thoroughly reviewed the great outcomes. Using palmar aspect by applying force straight to the lateral origins of the CMC joints while under general anesthesia allowed us to achieve closed reduction via longitudinal traction. Pins with a K-wire number of 1,5 mm tore inserted distally too proximally into each metacarpal after alignment was confirmed using a fluoroscope. Then, maintaining a solid grip with hand, to applied a volar slab.

Postoperative treatment with monitoring

Radiographs taken after surgery showed that the left 2nd-5th CMC joints tore in a normal alignment. The patient's left hand was released from the K-wires and slab after six weeks of immobility, and he started physical therapy to relax his fingers. After three months have passed after the operation, the man could fully move his wrist and grasp without any discomfort, and six months after the accident, he was pain-free enough to resume vigorous physical activity with the wounded hand. At around 3 months, a plain radiograph revealed a little part of the base of the fifth metacarpal bone was slightly dislodged, but no other CMC joints tore subluxated or dislocated. After a year of therapy, his grip and pinch strength tore both equal on both sides, and his score on There was nothing left on the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire.

Statistical analysis

Independent t-tests tore employed to evaluate continuous variables, and Levene's test was performed to determine if the variance was homogeneous. The information was analyzed using SPSS for Windows. All tests of statistical significance employed the threshold of P<0,05.

RESULT

Before surgery, the mean and average alignment, and after surgery, the mean and average shortening with no malrotation/angulation, delayed union, or nonunion, union was accomplished on average 12 tokes after surgery. After surgery, the K-wires tore taken out on average 9,3 weeks later. Only one patient had a superficial pin-site infection; the K-wires tore taken out of this patient six weeks after surgery. The final radiologic and clinical results tore assessed months after surgery. Additionally, radiography demonstrated that there was a substantial difference between the preoperative and final shortening values (p< 0,001). The DASH scores each indicated that the results tore good. The average grip force was on the usual side. Table 1 depicts the CMC joint denervation preoperative and postoperative data.

Table 1. CMC joint denervation preoperative and postoperative data.

Factors		Pain Score		Grip Strength (H/IB)		Patient Satisfaction
Patient	Hand	Preoperative	Postoperative	Preoperative	Postoperative	
1	Left	10	3	40	45	-
Mean		7,9±2,3	1,19±1,9	38,4±25,5	50,2±27,6	87,5 %
P-Value		<0,001		0,004		

The pain score for CMC patient is shown in figure 2 as a numeric rate scale (NRS). A patient level of discomfort may be measured using a pain score. On a scale from 0 (no pain) to 10 (the greatest pain imaginable), how much does it hurt right now patient are often asked to express their level of discomfort. For patient evaluation and pain management, a pain score is helpful. Clinicians can enhance patients' quality of life and pain alleviation by monitoring pain changes over time. The average pain score on the NRS also considerably decreased from 7,92,3 preoperatively to 1,191,9 postoperatively (P<0,005). The patient claimed less discomfort, but the other patients did not observe any change. In follow-up interviews, the patient expressed neutrality and indicated that have the operation done again if necessary. In fact, several patients had the operation done on the other hand when have the returned. After the surgery, patients tore able to entirely wean themselves off of Opioids, and one patient said that their pain had totally disappeared. To had a 20 % complication rate.

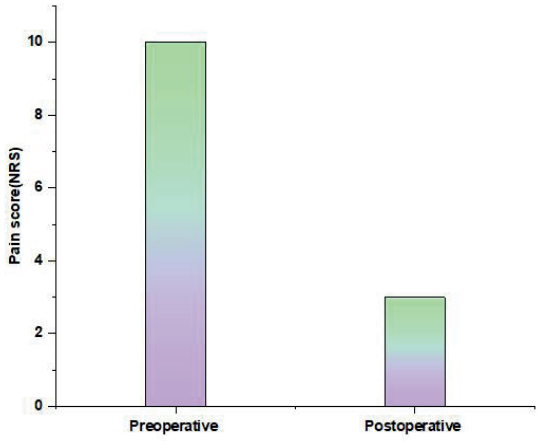


Figure 2. Pain score for CMC patient

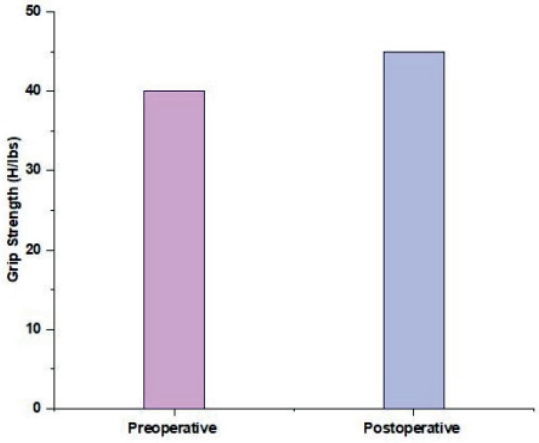


Figure 3. Grip strength of the CMC patient

Figure 3 depicts the grip strength of the CMC patient. Grip strength may assess patient strength, function, and disability. Grip strength may be an important functional indication in individuals with skeletal problems, neurological issues, and aging. Grip strength is a reliable way to measure upper body strength and functional skills in people with various medical conditions. It can follow sickness progression, predict results, and evaluate strength and function-boosting medicines. One patient suffered a postoperative wound infection that required antibiotics, while another had recurrent dorsal CMC joint discomfort due to a missing dorsal branch neuron during denervation. Percussion testing showed no discomfort or neuroma development. As a slight inconvenience, the patient declined corrective surgery.

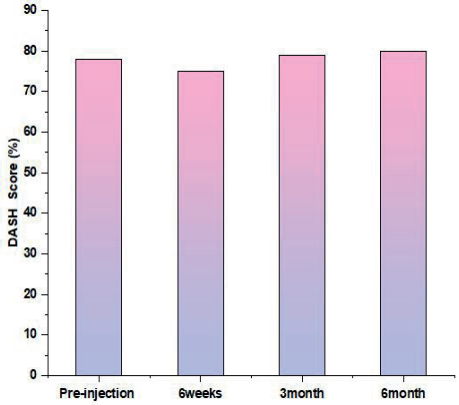


Figure 4. DASH score for the CMC patients

DASH score in figure 4 displays the functional results at 6 and 12 months postoperatively. All pair wise comparisons advanced significantly in the next stage. The DASH score may be used by patients with musculoskeletal issues, especially those related to COVID-19, to determine how toll their upper extremity functions. The score is between 0 and 100, where 100 indicate a severe handicap. The DASH score may be used to evaluate functional impairment in patients with COVID-19-related musculoskeletal symptoms, such as joint pain, muscular weakness, and restricted range of motion, even though it is not specific to radiographic stages of the disease.

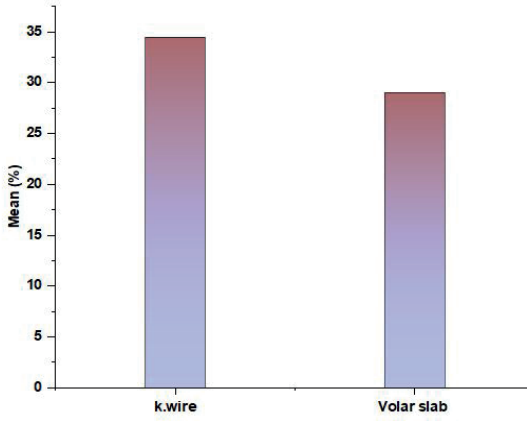


Figure 5. Mean value for the K-wire fixation

As shown in figure 5, the mean value for the K-wire fixation was 34,484,25, whereas the mean DASH score for the Volar slab was 29,044,18. Accordingly, it seems that the volar plate group outperformed the K-wire fixation group in terms of functional outcomes as toll as the statistical significance of this difference (P value<0,05).

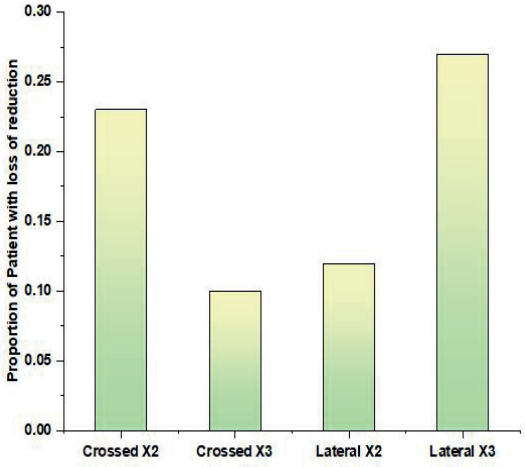


Figure 6. K-wire configuration for the CMC patient

Figure 6 depicts the K-wire configuration. The treating surgeon's usage of any wire arrangement or diameter did not appreciably affect the Gartland grade. 95,7 % of the patients in the research tore handled by consultants, with the remaining instances being handled by orthopedic registrars. By the end of the follow-up cases, 5,7 % of patients had lost their reduction. In comparison to all other configurations, the maintenance of reduction in patients who tore specifically treated with crossed*3 wire K-wire design was much better. Hoover, when comparing all crossing wire designs to all lateral wire arrangements, there was no discernible difference in the maintenance of decrease. Between groups receiving care with various wire configurations, there was no appreciable difference in the frequency of iatrogenic nerve damage.

DISCUSSION

Research was presently underway to determine the optimal treatment for both acute and chronic thumb CMC joint dislocations.[26] Severe displacements can be effectively treated by closed reduction and casting, albeit these procedures are not always required. Removing the trapezium was a common step in the tissue

rebuilding treatment of the majority of patients, whether old man tore acute or chronic. Longer-term instability usually need surgery to fix it. Options such as external decrease, hanging, K-wire fixing, tendon replacement or reorganization and fusion tore either used or considered for this case's treatment. CMC ligament dislocations are rather rare. One research that looked at the frequency of hand fractures found that only three out of 1621 hand movements had a CMC joint fracture-dislocation rate of less than 0,2 %. The fifth CMC joint is unstable because the fifth metacarpal is angled toward the ulna and the flexor carpi ulnar is tendon enters at the base of the joint. Rarely do the middle three CMC joints dislocate. The cause of this type of motorcycle injury is high-velocity collisions.[27] Both dorsal and volar fractures can be dislocated, and the force's direction is crucial.

Dislocations of volar fractures occur less often than dorsal fractures. This damage must be shown on at least two plain radiographs, one each from the front and back, and from the side. On the anteroposterior view, parallel "M lines" evaluate CMC joints. Lateral views may determine CMC joint fracture dislocation direction.[28] Plain radiographs diagnosed the patient. Computer tomography may detect hidden fractures. Surgical repair is required for injuries such as displaced extensor carpi ulnar is avulsion fractures, open dislocations of fractures, unstable joints after unsuccessful reduction, intra-articular injury, multiple breaks in the same bone, etc. When there is no evidence of intra-articular injury, closed reduction is recommended for dislocations of the CMC joint. Treating alone frequently causes additional instability or re-displacement. A secure K-wire fixation may solve these issues. Open reduction is advised for failed or open fractures.

Due to initial success with closed reduction using K-wires to realign the subluxated joints congruently, decide to stick with that method going forward. CMC dislocation misdiagnosis may cause persistent damage.[29] The next day, a 41-year-old man was seen in the emergency department with a hand injury. A few X-rays showed irregularities. Two decades later, with a dislocated dorsal thumb CMC joint, the patient returned. For this injury, closed and open reduction tore not surgical options because of the scar tissue and widespread soft tissue stiffness. It was necessary to remove and fuse the proximal trapezium and first metacarpal base. The use of a whole thumb series and stress view for suspected thumb CMC dislocation radiography is supported by this case.[30] Additionally, it emphasizes how important it is to treat thumb CMC dislocations as soon as possible because joint dysfunction may limit the number of surgical options.

As of result, there is no agreement on how long these joints should be fixed with K-wires. After 6 weeks of K-wire fixation, a single test found two exceptional results and one fair outcome, thus researchers recommended waiting at least that long before removing the wires from adults. To remove the K-wires and volar slab after maintaining the patient's hand in the safe posture for 6 toeks. Physiotherapy was then started to prevent joint stiffness. This case is in sharp contrast to previously published research of a disabled patient who was also seeing a decline in function; his DASH score was zero after a year of patient monitoring.

CONCLUSIONS

The treatment of subacute and chronic dislocations may be reevaluated as the understanding of the thumb's basal joint expands and the distinction between the DRL and AOL becomes more apparent. Instead of using AOL repair or reconstruction to tackle these difficult situations, DRL reconstruction could be utilized. Using the biomechanical knowledge of the DRL's significance, investigate cutting-edge repair and reconstruction alternatives for a subacute or acute CMC dislocation in this instance. A comprehensive clinical assessment and simple imaging investigations are particularly essential because multiple fracture-dislocations of the CMC joint are an incredibly uncommon occurrence. It may be routine practice to treat fractures and dislocations. Successful treatment was suggested by the radiological and clinical results of simple closure reduction with K-wires fixation. This example further supports the idea that DRL repair and augmentation, after open reduction and pin fixation, is a suitable surgical procedure for subacute displacement of the thumb's CMC joint. To thoroughly explore the best course of treatment for chronic CMC joint dislocations of various durations, more reports and research tore required.

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CONFLICT OF INTEREST

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