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ASSESSING FUNCTIONAL AND RADIOLOGICAL OUTCOMES OF DISTAL RADIUS FRACTURES TREATED WITH DORSAL PLATING

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ABSTRACT

This study assesses the functional outcome of a distal radius fracture treated with open reduction internal fixation (ORIF) and low-profile dorsal locking plates. The initial investigation will examine the functional outcome of distal radius fractures managed through open reduction and internal fixation with dorsal plating. Conversely, the subsequent study will focus on the radiological outcome of distal radius fractures treated with open reduction and internal fixation with dorsal plating. The surgical stabilization of these fractures continues to pose a challenge despite the significant research conducted on them for over two centuries. In open reduction internal fixation, dorsal plating has distinct advantages and ramifications. Based on the adjusted Green O'Brien score, 95 percent of our study's patients (n-19) attained favorable to exceptional outcomes. According to our research, we are sure that dorsal plating can consistently offer robust stabilization and a favorable functional outcome in distal radial fractures.

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1. INTRODUCTION

The most prevalent fractures in the upper extremity are distal radius fractures, which constitute 17% of all fractures and 75% of all fractures in the forearm [1]. The incidence of distal radius fractures and their associated consequences has risen in the overall population due to the increased lifespan of the population and the rising prevalence of osteoporosis [2]. The intricate structure of the wrist plays a significant role in the development of various traumatic injuries, a considerable number of which lead to long-term impairment of wrist functionality. The fractures exhibit a bimodal distribution, which can be classified into two distinct types [3,4,5]. Individuals in the age range of five to six decades who experienced low-energy fractures, specifically those associated with osteoporosis, as well as younger, primarily male patients who sustained injuries from high-energy trauma, such as a motor vehicle collision or a fall from an elevated position [6].

Closed reduction and cast immobilization have traditionally been the primary therapeutic approaches for these conditions. However, it is essential to note that malunion and subluxation/dislocation of the distal radioulnar joint can lead to unsatisfactory functional and visual outcomes [7]. The residual abnormality impairs wrist movements and hand functionality. The presence of arthritis in the radiocarpal and distal radioulnar joints can lead to various symptoms, such as pain, restricted mobility in the forearm, and reduced strength in gripping [8]. Volar plating is commonly preferred in distal radius fractures during the age of open reduction internal fixation. However, there is an ongoing dispute over the superiority of volar plating vs dorsal plating in treating these fractures. Dorsal plating has several advantages, such as direct reduction, assessment of articular alignment, evaluation, and treatment of intrinsic intercarpal ligament injury, and early initiation of range of motion.

2. MATERIALS & METHODS

A prospective, time-bound, hospital-based study was conducted at Sri Lakshmi Narayana Institute of Medical Science in Puducherry from August 2015 to November 2017. The study consisted of individuals who had fractures in the distal end of the radius and satisfied the specified inclusion criteria. Every patient received comprehensive information regarding the trial and provided their informed consent.

2.1. METHODS OF DATA COLLECTION

- By interview
- By clinical and radiological examination
- By follow-up at intervals at 6, 12, and 24 weeks

The necessary clinical data was recorded in a proforma created for the research following the hospital admission of the patient with a fracture at the distal end of the radius. Upon the completion of their therapy, patients were released from the hospital and scheduled for outpatient follow-up at regular intervals to undergo serial clinical evaluation. The patient underwent regular follow-up until the fracture was fully healed and functional recovery was achieved after surgery. If needed, further follow-up was conducted.

The study is proforma documented demographic data, medical history, clinical examination, and investigative details. To reduce discomfort, a volar slab was placed below the elbow. The patients underwent preoperative preparations, and standard preoperative investigations were conducted.

2.2. Specific investigation

X-ray of the wrist – posteroanterior view.

X-ray of the wrist -lateral view

Written informed consent for the surgery and study was obtained.

Patients were kept nil per oral overnight

All fracture was treated using open reduction internal fixation with dorsal plating.

2.3. OPERATIVE TECHNIQUE

Anesthesia: General / Supraclavicular block

Patient positioning:

The individual was in a supine position on the surgical table, with their arm supported by an arm board. The positioning of the image intensifier was designed to accommodate both posterior-anterior and lateral perspectives of the wrist. A prophylactic antibiotic was administered to all patients 30 minutes before the surgical procedure. A straight dorsal incision measuring 3 to 10 cm is performed, centered on the radial metaphysis anterior to Lister's tubercle. An ulnar-based retinacular flap is raised directly radial to the second compartment and elevated to expose the EPL and the tendons of the fourth extensor compartment. This exposure enables the imaging of the fracture components at the subperiosteal level. A fine osteotome is employed to excise Lister's tubercle near the bone. The size of the distal radius T component of the plate exhibits variation, with the small plate accommodating three screws, the medium plate accommodating four screws, and the large plate accommodating five screws. 2.7-mm screws are used for the distal T section of the plate, while 3.5-mm screws are used for the stem. The plate and screw heads, which have a thickness of 1.2 mm, securely fasten to the plate and align with the bone surface, resulting in a visually unobtrusive look for both the plate and screws.

3. RESULTS

The study sample consisted of patients aged 50.5 years, ranging from 20 to 70 years. Most of the patients fell within the age range of 20 to 30. This corresponded to the mean age range seen in previous studies. Distal

end radius fractures exhibit a bimodal age distribution. One is observed in younger women following a road traffic accident (RTA), whereas the other is observed in older women after menopause.

Table 1: Comparison of age distribution

Study	Sample size	Mean age(years)
Present study	20	50.5
Deepak CD (2014)[9]	20	35.2
D'Anca(1984) [10]	87	55
Yalavarthi (2015) [11]	33	31.5
Pieterse (1991) [12]	132	35.3

Our survey also found a similar pattern of male preponderance, with 12 males (60%) and eight females (40%) participating. The incidence of distal radius fractures is higher among males than females among the younger age cohorts.

Table 2: Comparison of sex distribution

Study	Sample size	Percentage of males	Percentage of females
Present size	20	60% (n=20)	40% (n=10)
Steffen (1994) [13]	55	69% (n=37)	31% (n=18)
Pieterse (1991) [10]	132	67% (n=71)	33% (n=44)
Riccardi (1984)[14]	48	60% (n=29)	40% (n=19)
Deepak cd (2014) [9]	20	90%(n=18)	10% (n=2)

In the present study, 55% (n=11) of the patients exhibited damage on the right side, whereas 45% (n=9) of the cases were affected on the left side. The results of our study were similar to those of prior research. The most common cause of distal and radius fractures is a fall on an extended hand. As a consequence, during the individual's recuperation from the injury, the dominant hand is progressively involved.

In our study, it was shown that a mere 40% of fractures were attributed to high-velocity injury, specifically road traffic collisions, while the remaining 60% were attributed to self-fall. Fractures occurring at the distal end of the radius exhibit a bimodal distribution, wherein fractures are more commonly observed in older female patients due to self-injury. In contrast, fractures are more commonly observed in younger male patients due to traffic collisions.

Table 3: Comparison of mode of injury

Study	Sample size	Percentage of cases RTA	Percentage of cases Of fall
Present study	50	40%	60%
Barbu (2007)[15]	36	24%	76%
Clyburn (1987)[17]	29	75.8%	24.2%
Deepak C D (2014)[9]	20	60%	40%

Eleven of the individuals in our investigation achieved fantastic outcomes. Seven patients got favorable results, one had medium results, and just one had terrible results. Ninety percent of the study's participants were in the excellent + good category.

The surgical treatment of distal radius fractures has progressed over the last 30 years from cast immobilization to a number of surgical solutions such as external fixation, open reduction, and internal with volar and dorsal locking plates. These surgical techniques have apparent advantages and disadvantages, but more research must be done to identify which treatment offers the most outstanding results. The distal radius governs the kinematics of the radiocarpal and radioulnar joints, so a successful anatomical reduction is a "condition sine qua non" for a positive clinical result. Early functional rehabilitation and a decrease in post-traumatic osteoarthritis are attainable with articular congruity repair and a solid fixation.

Volar fixation for dorsally angulated fractures has garnered much attention in recent years. Although the volar approach lowers the possibility of extensor tendon issues, the surgeon may be unable to see the articular surface. Furthermore, this plating process has an insufficient buttress effect, resulting in excessive bending stresses on the plate. In research by Orbay and Fernandez, most fractures treated with volar plating were not challenging, and the usual follow-up time was about 16 months. Extensor tendon irritation caused by inadequate screw placement on the volar surface of the plate forced the removal of three plates in their research.

4. CONCLUSION

Orthopedic surgeons frequently encounter distal radius fractures as a prevalent problem in emergency rooms worldwide. The surgical stabilization of these fractures continues to pose a challenge despite the significant research conducted on them for over two centuries. In open reduction internal fixation, dorsal plating has distinct advantages and ramifications. Based on the adjusted Green O'Brien score, 95 percent of our study's patients (n-19) attained favorable to exceptional outcomes. According to our research, we are sure that dorsal plating can consistently offer robust stabilization and a favorable functional outcome in distal radial fractures.

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COMPETING INTEREST

The authors declare no conflict of interest.

REFERENCES

[1]. Colles A. On the fracture of the carpal extremity of the radius. The New England Journal of Medicine, Surgery and Collateral Branches of Science. 1814 Oct 1;3(4):368-72.

[2]. Eckler AR. The Bureau of the Census. New York: Praeger; 1972.

[3]. Melton III LJ. Epidemiology of fractures. InOsteoporosis in Men 1999 Jan 1 (pp. 1-13). Academic Press.

[4]. Nellans KW, Kowalski E, Chung KC. The epidemiology of distal radius fractures. Hand clinics. 2012 May 1;28(2):113-25.

[5]. Larsen CF, Lauritsen J. Epidemiology of acute wrist trauma. International journal of epidemiology.

1993 Oct 1;22(5):911-6.
[6]. Bacorn RW, Kurtzke JF. COLLES'FRACTURE: A study of two thousand cases from the New York State Workmen's Compensation Board. JBJS. 1953 Jul 1;35(3):643-58.
[7]. Fernandez DL. Correction of post-traumatic wrist deformity in adults by osteotomy, bone-grafting, and internal fixation. JBJS. 1982 Oct 1;64(8):1164-78.
[8]. Seigerman D, Lutsky K, Fletcher D, Katt B, Kwok M, Mazur D, Sodha S, Beredjiklian PK. Complications in managing distal radius fractures: how do we avoid them?. Current reviews in musculoskeletal medicine. 2019 Jun 15;12:204-12.
[9]. Mohan JA. Surgical Management of Distal End Radius Fractures by Ligamentotaxis (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India)).
[10]. D'Anca AF, Sternlieb SB, Byron TW, Feinstein PA. External fixator management of unstable Colles' fractures: an alternative method. Orthopedics. 1984 May 1;7(5):853-9.
[11]. Yalavarthi RK, Vishal A. Outcome of management of distal radius fractures by ligamentotaxis. IOSR. 2015 Jul;14(7):33-7.
[12]. Saravanan KM, Zhang H, Hossain MT, Reza MS, Wei Y. Deep learning-based drug screening for COVID-19 and case studies. In Silico Modeling of Drugs Against Coronaviruses: Computational Tools and Protocols. 2021:631-60.
[13]. Steffen T, Eugster T, Jakob RP. Twelve years follow-up of fractures of the distal radius treated with the AO external fixator. Injury. 1994 Jan 1;25:SD44-54.
[14]. Seigerman D, Lutsky K, Fletcher D, Katt B, Kwok M, Mazur D, Sodha S, Beredjiklian PK. Complications in the management of distal radius fractures: how do we avoid them?. Current reviews in musculoskeletal medicine. 2019 Jun 15;12:204-12.
[15]. Wei DH, Poolman RW, Bhandari M, Wolfe VM, Rosenwasser MP. External fixation versus internal fixation for unstable distal radius fractures: a systematic review and meta-analysis of comparative clinical trials. Journal of orthopaedic trauma. 2012 Jul 1;26(7):386-94.
[16]. Ma C, Deng Q, Pu H, Cheng X, Kan Y, Yang J, Yusufu A, Cao L. External fixation is more suitable for intra-articular fractures of the distal radius in elderly patients. Bone Research. 2016 Jun 21;4(1):1-9.
[17]. Clyburn TA. Dynamic external fixation for comminuted intra-articular fractures of the distal end of the radius. JBJS. 1987 Feb 1;69(2):248-54.
[18]. WP C. External pin fixation for unstable Colles' fractures. J Bone Joint Surg [Am]. 1979;61:840-5.