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Comparison of the Clinical Outcome Measurement with Dash Score and Mayo Score at Total Elbow Arthroplasty Before and After Treatment: Case Report

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ABSTRACT

Background: Distal humerus fractures malunion is a challenge. The operation needed for this purpose is much more demanding. One of the treatments is total elbow arthroplasty (TEA) designs that aim to replicate anatomy and provide stability of physical function. We need to follow up on the function and symptoms after the treatment.

Objective: To evaluate the clinical outcomes of total elbow arthroplasty by comparing functional status before and after treatment using the Disabilities of the Arm, Shoulder and Hand (DASH) score and Mayo score.

Methodology: This study is a single-patient case report evaluating a patient who underwent TEA. Clinical outcomes were assessed before and after treatment using the DASH score and Mayo Elbow Performance Score to evaluate upper-extremity function, pain, range of motion, and functional performance.

Results: A 52-year-old male patient came to the hospital with a chief complaint of tenderness in right elbow in the last 2 years. The patient has a history of a traffic incident and has undergone surgical intervention twice. Physical examination shows that in the right elbow there are scar, deformity, angulation, and tenderness. The patient was measured with the DASH score and Mayo score. Before treatment with TEA, the patient's DASH score was 86.4 points and the Mayo score was 30 points. After 2 months and the patient received physiotherapy 6 times, the patient's DASH score was 43.2 points and the Mayo score was 55 points.

Conclusion: Total elbow joint arthroplasty for distal humerus fractures malunion has an increase in physical function and decreased symptoms measured with DASH score measurement and Mayo score measurement.

Keywords: DASH score; Mayo score; Total elbow arthroplasty; Clinical outcome

INTRODUCTION

Distal humerus fractures represent around 5%–7% of total humerus fractures and exhibit a bimodal age distribution, with a secondary surge of occurrence in older adults after low-energy injuries (1). The occurrence of intricate articular fractures of the distal humerus in adults has risen and is expected to continue increasing due to the heightened prevalence of high-energy trauma and a larger older demographic. Effective therapy is difficult because it requires balancing stability and recovery with early movement in osteoporotic and comminuted bone and joint components (2,3). Inadequate treatment or neglect of

such fractures can lead to malunion, joint incongruity, fibrosis, and severe rigidity (4). In chronic instances exhibiting significant degenerative alterations and diminished biological capacity, reconstructive fixing proves to be unreliable. Total elbow arthroplasty (TEA) has consequently become a viable salvage alternative for older individuals with irreparable distal humerus fractures and malunions, offering reliable pain alleviation and functional recovery (1,4,5). In intricate AO Foundation and Orthopaedic Trauma Association (AO/OTA) scenarios, partial or full fractures that cannot be reconstructed benefit from TEA, which provides rapid stability, prompt mobilisation, reliable pain alleviation, and detachment from the biological healing of fractures (1). Nonetheless, TEA constitutes a complex decision-making process and protocol that necessitates expertise in arthroplasty and the management of associated complications; considerations must always include stem loosening due to load transfer at the stem-cement-bone interface and polyethylene wear at the implant junction (1,6).

Latest literature with small sample sizes documented good clinical outcomes for the utilization of TEA in older patients in the short term. However, this evaluation mostly based on range of motion (ROM) and patient-oriented questionnaires that focus on activities of daily life, such as Mayo and DASH questionnaire, which take an increasingly essential role in assessing elbow function. The mayo score nevertheless was recently mentioned, due to the potential overestimation of results after TEA. On the other hand, DASH is considered a recommendable complementary questionnaire with documented validity, great reliability, and response to changes (7).

Despite advances in TEA, clinical outcomes may vary depending on the underlying condition, previous surgical history, and functional impairment of individual patients. Objective assessment using standardized clinical outcome measures is therefore important to evaluate functional improvement following treatment. The DASH and Mayo score provide complementary assessments of upper-extremity disability and elbow-specific functional outcomes. This case report presents a 52-year-old male patient with chief complaint of tenderness in the right elbow for the past two years following traffic incident, with a history of two previous surgical procedures. The report describes his clinical condition and evaluates changes in functional outcomes before and after TEA using DASH and Mayo score. By comparing this clinical outcome measures before and after treatment, this report aims to provide insight into the functional improvement and clinical effectiveness of total elbow arthroplasty in a patient with a complex history of right elbow injury and previous surgical interventions.

CASE PRESENTATION

A male patient who was 52 years old came to the hospital with the major concern of tenderness in right elbow in the last 2 years. According to the individual's medical history, they have been involved in a traffic accident and have undergone two surgical procedures. In the right elbow, the physical examination indicates the presence of a scar, as well as angulation, deformity, and discomfort. The patient underwent assessment using the DASH score and the Mayo score. Prior to TEA intervention, the patient's DASH score registered at 86.4 points, while the Mayo score was recorded at 30 points.



Figure- 1 Before surgery

After a span of two months, the patient had physiotherapy six times. The DASH assessment produced a total score of 43.2. The patient indicated experiencing moderate to severe challenges with various functional tasks, such as opening a tightly sealed jar, executing strenuous housekeeping duties, transporting a shopping bag or briefcase, and engaging in leisure activities that require force or impact with the upper limbs. The condition moderately disrupted social engagements and caused minor restrictions in work or other routine daily tasks. The patient additionally indicated moderate discomfort in the arm, shoulder, or hand, slight tingling sensations, and moderate challenges with sleep attributable to pain. Furthermore, Mayo score reached 55 points. The level of pain experienced by the patient was low to moderate, the patient's range of motion was greater than one hundred degrees, the patient was stable, and the patient was able to eat.



Figure- 2 After surgery



Figure- 3 Elbow extension



Figure-4 Elbow flexion

PRE-OPERATIVE AND POST-OPERATIVE SCORE

SCORE	PRE	POST
DASH	86.4	43.2
Mayo	30	55

DISCUSSION

This case report examines a 52-year-old male patient suffering from malunion of a distal humerus fracture who received a total elbow arthroplasty (TEA). This case aligns with a study conducted in the United States (U.S), which indicated that over the years, TEA was primarily performed for fractures of the distal humerus and their serious repercussions (6). Essential components of the decision-making process encompass: fracture classification, patient age, comorbid conditions, functional capacity, bone integrity, degree of comminution or segmental bone loss, and post-treatment functional requirements. In irreparable distal humerus fractures, where open reduction and internal fixation cannot be performed due to fragment diminutiveness, extensive comminution, and/or substandard bone integrity, total elbow arthroplasty is the preferred intervention. Enhanced attention must to be afforded to individuals with prior arthrosis or inflammatory arthritis. Contraindications encompass neurological impairment impacting hand functionality and patients who are demented or noncompliant. Ultimately, relative contraindications encompass open fractures or situations where the patient necessitates weight bearing through the upper limbs (3).

The patient underwent assessment using the DASH score and the Mayo score. The DASH questionnaire is appropriate for individuals with musculoskeletal disorders of the upper extremities and comprises 30 items. Every item is evaluated using a 5-point scale. Twelve enquiries evaluate daily living activities, six enquiries examine symptoms, and three enquiries analyse social and occupational restrictions. The evaluations for each item are used to determine a conclusive score that spans from 0 (indicating no disability) to 100 (representing severe disability). The DASH's reliability, validity, and responsiveness have been assessed in patients with conditions affecting the primary regions of the extremities, namely the shoulder, elbow, wrist, and hand (8). In the subsequent evaluation by Tarallo et al., two clinical questionnaires were employed to assess joint functionality: the Mayo score which quantifies elbow joint performance on a scale from 0 to 100, and the QuickDASH, a streamlined variant of the DASH score ("Disabilities of the Arm, Shoulder, and Hand"), which is a non-specific assessment for the elbow that measures remaining upper limb disability (9). It should be noted that Full DASH and QuickDASH, while scored on the same 0–100 range, are derived from different item sets and are not directly interchangeable; comparisons across studies using different versions are therefore interpreted qualitatively rather than as equivalent absolute values.

The DASH score of the patient in this report decreased from 86,4 to 43.2 and the patient's Mayo score rose from 30 to 55 points. A lower DASH score means better upper-limb function and fewer or less severe symptoms, while a higher score on the Mayo Score means better elbow function and less pain. The Mayo questionnaire in research conducted by Tarallo et al. revealed that 21 patients (41.2%) achieved a "excellent" score (over 90 points), 14 (27.4%) received a "good" rating (between 75 and 89), nine (17.6%) attained a "sufficient" score (between 60 and 74), and seven (13.7%) garnered a "poor" score (below 60). The mean score was 79.7 ± 18.3, with 68.6% of patients attaining a rating classified as good to excellent. The assessment revealed an average range of motion (ROM) of 95°±27°, with 33 elbows (64.7%) exhibiting a ROM beyond 100°, 13 (25.4%) falling between 100° and 50°, and merely five (9.8%) below 50°. The remaining impairment of the surgically treated upper limb was examined (9). Furthermore, research by Stoddart et al. showed a total of eight hundred and thirty fractures received TEA. The average flexion arc was 103.6 degrees (range 79–119, 412 elbows), mean MEPS was 89.3 (range 73–96, 497 elbows), and mean DASH was 32.9 (range 23–52, 306 elbows). The reported

incidence of adverse events was 36.1% (10.0–75.0%, 747 elbows), while the overall reoperation rate was 15.5% (0.0–63.6%, 810 elbows) (10).

Study by Zhang et al. also demonstrated that the MEPS score significantly increased from 38.8 ± 22.6 points (range: 10–50 points) prior to TEA to 90.8 ± 10.3 points (range: 68–98 points) following the procedure. On the other hand, the DASH score exhibited a notable reduction from 68.4 ± 19.2 (range: 58–86 points) prior to surgery to 37.3 ± 18.8 points (range: 18–52 points) following the operation (11). In addition, elevated Mayo scores have been observed in individuals with preexisting RA and distal humerus fractures (DHF) who received acute TEA. A study demonstrated that acute TEA leads to markedly improved DASH scores at six months and superior Mayo score at two years in comparison to ORIF (12). Similar to the results in a study by Liu et al. with the mean Quick DASH score of the cohort at the last follow-up was 41. Individuals in the acute cohort experienced the briefest duration of follow-up, whereas those in the ORIF cohort had the most extended follow-up period. Quick DASH scores were markedly superior in the acute cohort and inferior in the nonsurgical cohort (31 versus 44 vs 76) (12).

A study included a total of 1276 patients who underwent TEA in their systematic evaluation across 23 trials. Out of these, 1060 patients received TEA for rheumatoid arthritis, whereas 257 individuals underwent the procedure for alternative reasons, such as trauma. At the concluding follow-up, the average Quick DASH and Mayo scores were 39.2 and 89.1, respectively. They stated that 63.3% of patients acknowledged experiencing no discomfort during the follow-up. The authors determined that TEA provides patients with acceptable clinical results over long-term follow-up, exhibiting comparatively consistent rates of revision and complications when contrasted with short and mid-term follow-up (8). Another study conducted by Wilfred et al. found that the average post-operative Full DASH score was documented in five trials, encompassing a total of 75 patients. Scores varied from 0 (indicating no disability) to 100 (representing the most severe disability). The average post-operative Full DASH score was 25.4 (10.3) points. The average post-operative QuickDASH score (SD) from three studies comprising 48 patients was 15.7 (7.4) points (range 0–55) and the average post-operative Mayo score was 83.6 (6.1) out of a possible 100 points, with scores ranging from 50 to 100 (5).

In contrast, study by Mühlenfeld et al. do not reach the DASH scores reported in a recent 2019 study, which indicated a mean score of 24 ± 12 (range 8–43) among individuals with an average age of 66 years. A German study conducted in 2012 produced outstanding scores, with a mean score of 8.43 (range 0–28) for patients with TEA (mean age = 65). Clearly, the participants in both investigations were markedly younger than the group in their research. Senior patients frequently have a prior diminished capacity in routine tasks. An elevation in the DASH score with advancing age has been shown, elucidating the diminished scores in this research relative to the aforementioned studies. Age appears to be a significant variable when evaluating patient-reported outcome measures following total elbow arthroplasty (7). Employing the MEPS, enhanced results were noted in less-invasive surgeries (INS), primary or post-traumatic osteoarthritis (OA), and non-synthesizable fractures of the distal humerus (FX) categories when contrasted with the rheumatoid arthritis (RA) and ankylosis (ANK) groups, despite the latter demonstrating overall acceptable assessments. The QuickDASH evaluates remaining impairment throughout the complete upper limb (9).

CONCLUSION

In this case, total elbow arthroplasty for distal humerus fracture malunion led to meaningful functional improvement, with DASH and Mayo scores both showing favorable changes post-treatment. These

findings support total elbow arthroplasty as a viable option for restoring function in patients with post-traumatic elbow malunion.

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