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A comparison between different therapeutic concepts regarding the distal radius fractures

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The treatment of the distal radius fractures is, after a very long period of debates, a still challenging problem. There is no general consensus regarding the optimal treatment of these fractures, many independent factors being involved as the type of fracture, age, preexisting conditions etc. There are also economic factors involved in developing countries in which there could be observed a tendency towards the conservative less expensive treatment of this pathology.

The objectives of our study were to compare the methods of treatment (conservative versus surgical) and the clinical and radiological outcomes of those treatments.

The cohort of patients consists in 100 consecutive distal radius fracture cases presented to the emergency room of Bagdasar-Arseni Emergency Hospital in Bucharest during a three months period, and met the inclusion criteria and gave and maintained their consent to be enrolled in this study. Out of these patients, 13 were admitted for surgical treatment and 87 were treated conservatively, on outpatient basis.

The age distribution of the subjects was from 21 to 88 years old, with a mean age of 62,28. The gender distribution was 76 women and 24 men. Regarding the type of fracture and using the AO/ASIF classification, there were 51% type A extraarticular fractures (20 A2 and 31 A3), 2% B partial articular fractures (both B2) and 47% C articular fractures (15 C1, 18 C2 and 14 C3).

The inclusion criteria were bone maturity (adults), isolated distal radius fracture without any ipsilateral or contralateral upper limb traumatic involvement, absence of preexistent wrist conditions such as arthritis, malunions, tumors or rheumatic diseases and patient consent to be enrolled in the study.

In the clinical evaluation of the outcome the Mayo score (ANEX 2), the DASH score (ANEX 3), an 1 to 10 analogue visual scale of patient satisfaction evaluation (ANEX 4) were used, as well as the measurement of the range of motion, grip strength and the incidence of various possible complications. The clinical evaluation were made at 6 weeks and 6 months after initial treatment.

The range of motion and grip strength were evaluated as percentage of the performance (mobility or strength) of the uninjured contralateral wrist as measured at the clinical evaluations at 6 weeks and 6 months after initial discharge, regardless the type of treatment.

At each visit, plain antero-posterior and lateral view of the wrist were made. The following parameters were followed : the angles of distal radial epiphysis (radial inclination on antero-posterior view and volar tilt on lateral view), the radial length on antero-posterior view, the presence of articular incongruity and the presence of arthritic changes.

For each patient, a formulary (Study Admission Form) was completed. (ANEX 1)

The pre-planned statistical analysis compared the recorded clinical parameters between the surgically and conservative treated patients. As the baseline analysis showed significant difference in the demographic and severity indicators, the statistical tests are based on the multivariate analysis, to account for the baseline factors' influence on the outcome variables.

The 6 weeks and 6 months time-points of the statistical analysis were pre-planned and included in the protocol, so no multiplicity adjustments were performed for the statistical tests used.

The clinical results were as follows:

The mean range of motion at 6 months was 75,89% of the contralateral wrist mobility (86,54% for the surgical treated patients and 74,29% in the conservative group). Independent factors of prediction of the ROM score were the AO type of fracture, masculine gender and surgical treatment, $p=0.001$. Factors predicting a better outcome of the patients were age and the A2 subtype of AO classification. In the more severe patients subgroup, i.e. with C type of fracture, the single predictor of outcome, as measured by ROM score, is the surgical treatment. (84,09% versus 68,11% in the conservative group).

The mean grip strength for the surgical group was 20,46% at 6 weeks and 81,61% at 6 months. The conservative group had a percentage of 13,66% at 6 weeks and 60,28% at 6 months.

At 6 weeks, independent factors of prediction of the grip strength were age and severity of fracture ($p= 0.001$ and 0.006 respectively) .Similar statistical results were encountered at 6 months, with addition of gender (masculine gender is a good predictor; $p=0.008$). Regarding the intraarticular fractures (AO type C), only age is a predictor of grip strength recovery (the lower the age, the better the outcome), as measured by grip strength.

The surgical treated patients scored at 6 weeks a mean 42,77 DASH score and at 6 months after initial discharge a mean 10,54 .The conservative treated patients had a mean DASH score at 6 weeks of 49,14 and at 6 months a mean score of 23,29.

At 6 weeks, a positive outcome defined as the DASH score below median was positively influenced by surgical treatment (with a odd ratio of 4.6 and $p=0.025$) and by lowest severity of fracture (AO type A2), OR =7.4, $p=0.013$. At 6 months the only positive outcome predictor remains the surgical treatment (OR=3.9 and $p=0.049$).

In the subgroup of C-type fracture subjects, DASH score at 6 months was influenced only by the type of treatment ($p=0.07$, standardized beta coefficient=-0.39). The mean DASH score at 6 months after initial discharge for conservative treated patients was of 27,64 versus a mean score of 12,1 for surgical treatment.

The surgical patients had a mean Mayo score of 49,62 at 6 weeks and 78,85 at 6 months after initial discharge. The conservative treated patients scored a mean of 41,51 at 6 weeks and a mean of 69,08 points at 6 months after initial discharge.

The surgical treated patients had a mean Visual Analogue Scale score of 12,92 points at 6 weeks and of 6,46 points at 6 months after initial discharge. The conservative group scored a mean of 11,76 points at 6 weeks and a mean of 8,45 points at 6 months after initial discharge. At 6 months the treatment was the main independent factor of prediction for a good outcome together with the masculine gender. Analyzing only the subgroup of C-type fractures the single predictor of good outcome for the Analogue Visual Scale at 6 months is the surgical treatment.

The acceptable radiological results were considered less than 2 mm articular congruity, radial inclination more than 20° , dorsal tilt less than 10° and radial shortening less than 5 mm.

In the subgroup of surgical treatment consisting of 13 patients, all of the radiological measurements shown (both at 6 weeks and 6 months) the maintenance of the acceptable reduction (as defined above) achieved by surgery.

In the subgroup of conservative treatment all of the patients (87) had acceptable reduction at initial discharge, after manipulation (if necessary) and casting.

At 6 months, 50 patients out of 87 (57.47%) suffered a loss of the initial reduction, considered as angles or height out of the range of acceptable reduction. The mean radial inclination loss was of 13.64 degrees, the mean volar tilt loss was 11.24 degrees and the mean radial height loss was 1.58 mm.

At the end of the follow-up (6 months after the initial discharge), the results showed that the surgical treatment influenced positively the recovery of range of motion for the whole cohort (together

with the lowest severity of fracture and masculine gender) and for the C-type of fracture group (as main predictor).

The grip strength measurements showed as main predictor the age of the patient only.

The DASH score was positively influenced by the surgical treatment, at 6 weeks, 6 months of follow-up and also in the C-type subgroup of patients.

The Visual Analogue Score was influenced positively by the surgical treatment for the whole group and for the C-type fractures subgroup.

Radiological, all the complications were encountered in the conservative group (57.47% of the conservatively treated patients suffered a loss of reduction in various degrees), which necessitated a surgical procedure in 7 cases out of 50 (14%).

The radiological outcome as well as clinical instruments either objective (as range of motion) or subjective (DASH and VAS scores), pleads for the surgical treatment in this type of fractures.

