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Do Colles' fracture patients benefit from routine referral to physiotherapy following cast removal?

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Abstract Colles' fracture patients who received physiotherapy immediately following cast removal were compared with patients who received no active therapy following cast removal in a prospective randomised study. Patients who attended physiotherapy achieved significantly greater increases in wrist extension and grip strength after 6 weeks compared to patients who received no active therapy.

Introduction

Colles' fracture is the most common fracture in people over the age of 40 years [3]. Anecdotal evidence suggests the routine referral of such patients to physiotherapy following cast removal. The rationale for physiotherapy is that it addresses the most important principle of fracture management, which is movement [1]. The aim of this study was to determine whether or not Colles' fracture patients benefited from routine referral to physiotherapy following cast removal, with the hypothesis that patients who attended physiotherapy would have a better outcome than patients who did not attend physiotherapy.

Patients and methods

Eighteen Colles' fracture patients with no significant past history were recruited from an orthopaedic outpatient department of a metropolitan hospital. Subjects were randomly allocated to either a phys-

iotherapy ($n = 9$) or non-physiotherapy ($n = 9$) group. There were no significant differences between the groups regarding age, sex, hand affected (dominant or non-dominant), number of days immobilised, number of days until review and severity of initial fracture, classified according to the Frykman scale (Table 1) [4].

Procedure

All subjects gave informed consent to participate in the study, which had been approved by both the hospital and the university ethics committees. Initial measurements of wrist extension (using a volar goniometer) and grip strength (using a Jamar dynamometer) were taken by the investigator immediately following cast removal. The subjects were then randomly allocated to either the physiotherapy or non-physiotherapy group, with the investigator blinded to group allocation.

Subjects allocated to the physiotherapy group received treatment as outpatients at the physiotherapy department of the hospital. Treatment was given at the discretion of the hospital therapists with the content of the treatments recorded but not controlled. Patients attended physiotherapy on an average of 5.0 (SD 1.6) occasions. Treatment typically consisted of active exercise including a home exercise program (all treatments), home advice (all treatments) and passive joint mobilisation (47% of treatments).

Subjects allocated to the non-physiotherapy group were given a home exercise sheet and simple home instructions by the orthopaedic surgeon or registrar. These subjects received no further treatment until a review appointment 6 weeks later.

All subjects were reviewed 6 weeks (± 7 days) after cast removal. Review measurements of wrist extension and grip strength were taken by the same blinded investigator.

Apparatus and assessment procedures

Active range of wrist extension was measured because it is frequently the most restricted movement following cast removal in a Colles' fracture patient, due to immobilisation in a position of slight wrist flexion [2]. Furthermore, it is an important indicator of hand function, given that the hand is best adapted for its function of prehension when the wrist is 40° – 45° extended [6]. The volar method of measurement was used as it is the most reliable one [7]. The investigator used an Allen & Handbury's pocket volar goniometer.

Grip strength was measured because it correlates highly with hand function [11]. The Jamar dynamometer was used as it is recognised as the standard, reliable instrument for measurement of grip strength [8]. Standardised subject position and instructions were used to improve test-retest reliability [2].

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Table 1 Subjects' demographics

	Treatment group	
	Physiotherapy	Non-physiotherapy
Age (years) (SD)	74.4 (10.2)	77.3 (5.1)
Sex (M:F)	0:9	1:8
Hand affected (dominant:non-dominant)	5:4	4:5
Number of days immobilised (SD)	43.9 (4.4)	43.3 (5.1)
Number of days until review (SD)	44.2 (5.9)	41.4 (4.6)
Frykman classification (I-VIII)	2 × I, 0 × II, 0 × III, 1 × IV, 1 × V, 0 × VI, 3 × VII, 2 × VIII	1 × I, 1 × II, 2 × III, 1 × IV, 2 × V, 0 × VI, 0 × VII, 2 × VIII

Data analysis

A split plot analysis of variance (SPANOVA) was used to compare the change in range of movement of active wrist extension, expressed in degrees, in the physiotherapy and non-physiotherapy groups. This comparison was made by evaluating the interaction (AB) effect.

Data collected for grip strength in kilograms force failed to meet the assumption of homogeneity of variance, and therefore the same data analysis could not be used. A Mann-Whitney U-test was employed to compare the change scores (final strength minus initial strength) for the two groups. The Mann-Whitney U-test is the non-parametric equivalent to a *t*-test carried out on the change scores, which is mathematically equivalent to the AB interaction effect determined using a SPANOVA [12].

One-tailed tests were used for both the analysis of change in strength and change in range of wrist extension. The level of significance was set at *P* = 0.05.

Results

Wrist extension

The increase in wrist extension between the initial measurement and the 6-week follow-up was significantly greater in the physiotherapy group (Fig. 1).

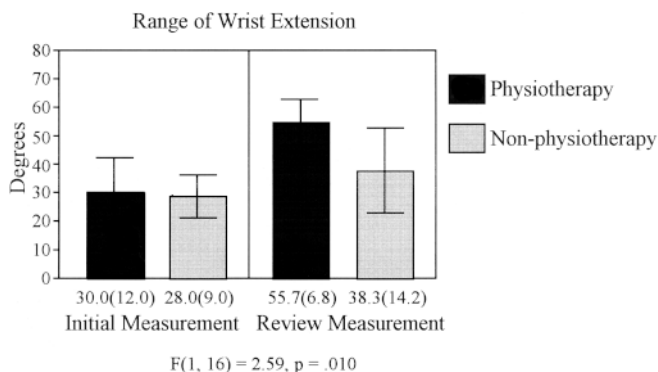


Fig. 1 Initial and final mean wrist extension for the physiotherapy and non-physiotherapy groups. Standard deviation denoted by error bars. Mean and standard deviation for each group denoted at the bottom of the figure

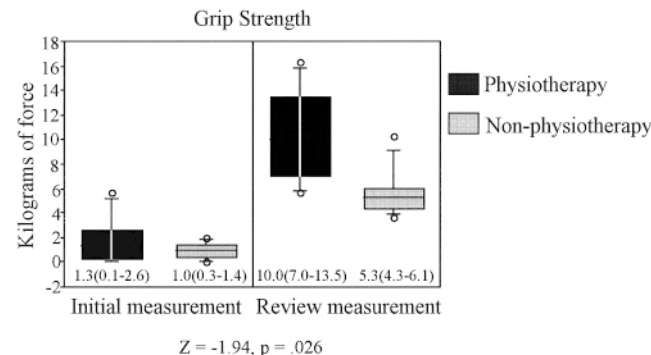


Fig. 2 Initial and final mean grip strength for the physiotherapy and non-physiotherapy groups. The median (interquartile range) is denoted at the bottom of the figure. Small circles represent outliers which failed to fall within the 10th and 90th percentiles, denoted by error bars. The extremities of the boxes represent the 25th and 75th percentiles, sometimes referred to as the interquartile range, and the solid line inside the box represents the median

Grip strength

The increase in grip strength between the initial measurement and the 6-week follow-up was significantly greater in the physiotherapy group (Fig. 2).

Discussion

Our results suggest that routine referral of Colles' fracture patients to physiotherapy following cast removal is beneficial. The greater increase in wrist extension and grip strength in those patients receiving physiotherapy was clinically significant given that the fractures were at the stage of consolidation of fracture healing [1]. At this stage patients may recommence all hobbies and return to heavier manual work. Subjects who did not attend physiotherapy would have found many of these tasks difficult due to lack of the necessary wrist extension and grip strength required for optimal prehension. However, subjects who attended physiotherapy possessed the necessary wrist extension and grip strength, making the transition to such activities much easier.

Although not the primary aim of the study, we hypothesise that the physiotherapy group did better than the non-physiotherapy group because they benefited from reinforcement of both home advice and active exercise. Such reinforcement included clinical reasoning on the part of the treating therapist which incorporates decision-making, problem-solving and making clinical judgements [5]. A previous study failed to find any benefit from the addition of passive joint mobilisation to physiotherapy for Colles' fracture patients following cast removal [13]. There is a need for further investigation to determine the important components of physiotherapy in Colles' fracture rehabilitation.

Past studies that have compared physiotherapy to no physiotherapy in Colles' fracture patients have shown no difference in outcome [9, 10]. Pasila et al. [10] analysed 96 patients to determine whether recovery was hastened when exercise was supervised by a physiotherapist. No statistical difference could be detected. However, this was exercise of the non-involved joints during the period of immobilisation. Hence, these exercises could not have been expected to influence the range of movement around the wrist following cast removal.

Oskarsson et al. [9] compared supervision by physiotherapists, starting 4–6 weeks after cast removal, with self-training in 110 Colles' fracture patients. Despite their conclusion that physiotherapy subjects had the same outcome as non-physiotherapy subjects, inspection of their raw data table demonstrated that subjects in the physiotherapy group showed a greater increase ($P = 0.01$) in wrist movement than subjects in the non-physiotherapy group. Such a finding is consistent with our study.

In conclusion, we found that Colles' fracture patients referred to physiotherapy demonstrated a greater increase in wrist extension and grip strength in the period from fracture union to consolidation than patients who received no active therapy.

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