Arthritis & Rheumatism (Arthritis Care & Research)
Vol. 53, No. 2, April 15, 2005, pp 214–222
DOI 10.1002/art.21087

ORIGINAL ARTICLE

Effectiveness of Manual Therapy or Pulsed Shortwave Diathermy in Addition to Advice and Exercise for Neck Disorders: A Pragmatic Randomized Controlled Trial in Physical Therapy Clinics

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Objective. **To determine whether manual therapy or pulsed shortwave diathermy, in addition to advice and exercise, provide better clinical outcome at 6 months than advice and exercise alone in primary care patients with nonspecific neck disorders.**

Methods. **This was a multicenter, 3-arm randomized controlled trial in 15 physical therapy departments. Of the 735 screened patients, 350 were recruited to the study (mean age 51 years) from July 2000 to June 2002. Participants were randomized to advice and exercise plus manual therapy, advice and exercise plus pulsed shortwave, or advice and exercise alone. Assessments were undertaken at baseline, 6 weeks, and 6 months. The primary outcome was the Northwick Park Neck Pain Questionnaire. Analysis was by intention to treat.**

Results. **Of the participants, 115 were allocated to advice and exercise, 114 to advice and exercise plus manual therapy, and 121 to advice and exercise plus pulsed shortwave; 98% received the allocated treatment. There was 93% followup at 6 months. The mean ± SD fall in Northwick Park score at 6 months was 11.5 ± 15.7 for advice and exercise alone, 10.2 ± 14.1 for advice and exercise plus manual therapy, and 10.3 ± 15.0 for advice and exercise plus pulsed shortwave. There were no statistically significant differences in mean changes between groups.**

Conclusion. **The addition of pulsed shortwave or manual therapy to advice and exercise did not provide any additional benefits in the physical therapy treatment of neck disorders.**

KEY WORDS. Neck disorders; Physical therapy; Primary care.

INTRODUCTION

Neck disorders affect 13% of adults at any one time and up to 30% of men and 50% of women in the course of a lifetime (1–3). Precise diagnosis by clinical examination is problematic (4) because signs and symptoms are frequently nonspecific and have poor reproducibility. One approach in primary care, which has gained widespread acceptability in the field of low back pain, is to adopt a red flag system for identifying signs and symptoms of potentially serious disease (5). Once red flags have been excluded, patients are classified as having simple or nonspecific neck pain.

Most patients with nonspecific neck pain do not require specialist investigation or treatment. In the United Kingdom, referral to physical therapy for further assessment and management is popular because of reduced wait times, lower costs, and potentially quicker recovery for the patient compared with referral to secondary care (6). Treatments commonly used by physical therapists include patient education and advice, exercise, manual therapy, and electrotherapy (7).

Systematic reviews of physical therapy modalities for neck pain report a lack of high-quality evidence of their efficacy, and highlight poor methodologic quality in many

The groups funding the study (Trial ISRCTN77535030) had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Supported by grants from The Arthritis Research Campaign and the West Midlands R & D NHS (Executive).

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Submitted for publication August 12, 2004; accepted in revised form December 6, 2004.

studies (8). There is limited evidence for the short-term effectiveness of manual therapy for cervical spine pain compared with other treatments (2,9), particularly in combination with exercise (10). Clinical practice guidelines recommend the use of manual therapy along with exercise therapy for managing mechanical neck disorders (11). Electrotherapy has a long history of use in physical therapy treatment programs (12–14) and 2 high-quality trials reported that pulsed shortwave diathermy (PSWD) significantly reduced pain in patients with mechanical neck pain (15,16). These studies used a novel approach in which PSWD was delivered in small portable units inserted into surgical collars, which is not common practice in the United Kingdom. Little is known about appropriate therapeutic doses (17–19).

We reviewed and evaluated the evidence regarding the effectiveness of physical therapy for nonspecific neck pain in a series of workshops with 28 musculoskeletal physical therapists (20). The consensus was that there was a need to compare the benefit of adding manual therapy or PSWD with an acceptable minimal conservative treatment for neck pain—namely advice and exercise. This topic has also been identified as a priority area for research by consumers, physical therapists, directors of public health, and other professions (21).

We therefore studied whether manual therapy (with advice and exercise) or PSWD (with advice and exercise) is better than advice and exercise alone in the treatment of nonspecific neck disorders. We adopted a pragmatic approach, which addressed the comparative effectiveness of broad treatment packages in a clinical context in which tight experimental control and blinding of the therapist and patient were impossible (22).

PATIENTS AND METHODS

Study participants. This was a multicenter pragmatic randomized controlled trial in 15 physical therapy outpatient facilities in the Midlands, UK. Ethical approval was granted by the West Midlands Multicenter Research Ethics Committee and 10 local Research Ethics Committees. Written informed consent was obtained from all participants prior to randomization.

Eligible participants were aged 18 years and older with a clinical diagnosis of nonspecific neck pain. They all had been referred to physical therapy with a new episode of neck pain by their general practitioner (GP), not having consulted any health care professional other than the primary health care team for this problem in the previous 6 months. Nonspecific neck pain was defined as pain and/or stiffness in the cervical spine, with or without unilateral arm pain, after the exclusion of red flags. Red flags included weight loss, fever, progressive neurologic signs including bilateral arm pain, evidence of muscle weakness or disturbance in normal sensation, history of malignancy, inflammatory arthritis, polymyalgia rheumatica, osteoporosis, or gross structural or neurologic abnormality affecting the neck. Participants with contraindications to the study treatments (e.g., patients taking anticoagulants), any injury awaiting a compensation claim (e.g., deceleration or industrial injury), or pregnancy were also excluded.

Randomization. The random allocation sequence was generated by computer at the Birmingham Clinical Trials Unit (BCTU), Birmingham University, in random-sized blocks stratified by physical therapy department. The recruiting physical therapist undertook the baseline assessments, gained informed consent, and registered participants into the trial by telephoning patient details to the BCTU. Participants were allocated a unique study number and were randomized to the treatment groups in a 1:1:1 ratio. The recruiting physical therapists were blind to followup assessments (these were undertaken by post). The treating physical therapist and the participant were not blinded to the interventions.

Interventions. All participants were randomized to 1 of 3 groups: 1) advice and exercise with no further addition to treatment; 2) advice and exercise with the addition of manual therapy; or 3) advice and exercise with the addition of pulsed shortwave diathermy.

The study interventions were delivered by 55 experienced senior musculoskeletal therapists who attended a study day to agree on the content of the study protocols (see below) and to standardize their treatment approaches prior to the trial. The treating physical therapists delivered a maximum of 8 20-minute sessions over 6 weeks. The exact length and detailed content of the interventions were at the clinical discretion of the treating physical therapists. If participants' symptoms remained troublesome after 6 weeks, they were advised to return to their GP and further treatment was instigated according to usual practice.

Study protocols. A written study protocol was provided for each arm of the trial (see below). Participants' GPs were contacted by letter prior to randomization to ask them to avoid prescribing cointerventions during the first 6 weeks of the trial. Nonsteroidal antiinflammatory drugs were continued at a stable dose.

Advice and exercise. All participants received individualized education and advice and were instructed about appropriate exercises, including a home exercise program. Exercises included active and resisted neck movements in sitting, selected from the computer software package Physio Tools (www.physiotools.net), and verbal advice was reinforced by the Arthritis Research Campaign's "Pain in the Neck" booklet (www.arc.org.uk). Advice about coping with neck pain focused on the following key messages: neck pain is common, pain is not usually due to any serious disease, activities may need to be reduced for a time but rest does more harm than good, and people who cope best are those who stay active despite their pain. Topics discussed included possible reasons for neck pain, pain control including analgesic use, increase in activity level, and neck exercises.

Advice and exercise with the addition of manual therapy. In addition to advice and exercise, each treatment session included manual therapy techniques. Manual therapy was defined as hands-on, passive or active assisted

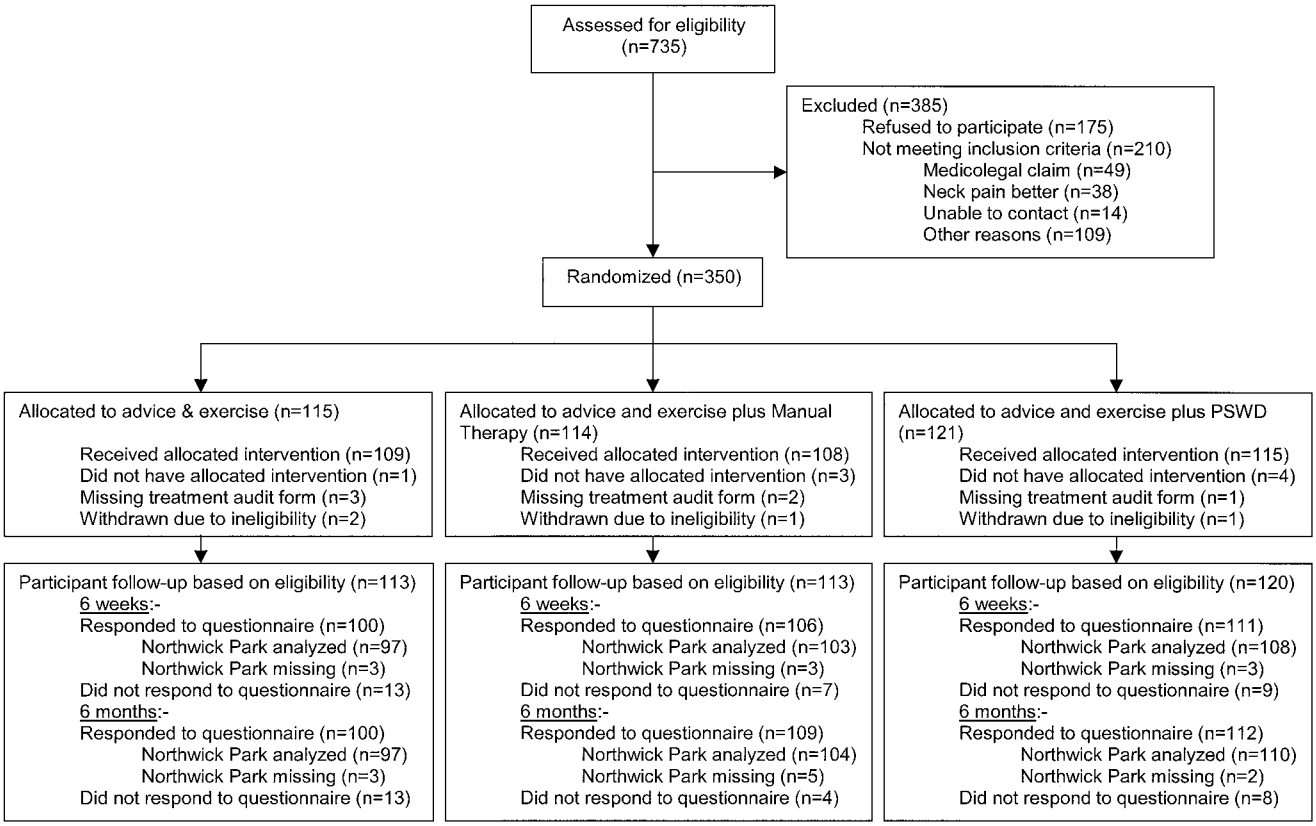

Figure 1. Trial profile. PSWD = pulsed shortwave diathermy.

movements, mobilizations, or manipulations to the joints and soft tissue, graded as appropriate to the patient's signs and symptoms.

Advice and exercise with the addition of PSWD. In addition to advice and exercise, each treatment session included PSWD, delivered according to current best available evidence appropriate for UK clinical practice. The exact dosage given was not prescriptive, but was in accordance with professional guidelines to good practice (23). The number and content of the treatment sessions were recorded on case report forms, and audited against the clinical physical therapy treatment records.

Outcomes. Outcomes were measured at baseline, 6 weeks, and 6 months. The primary outcome measure was disability measured with the Northwick Park Neck Pain Questionnaire (9 items, scale 0–100) (24). This neck-specific questionnaire covers the following areas: neck pain intensity, neck pain and sleeping, pins and needles or numbness in the arms at night, duration of symptoms, carrying items, reading and watching TV, working and housework, social activities, and driving. The 9 items are scored from 0 to 4 and the total score converted into a percentage (0–100). Secondary outcome measures included participants' global assessment of change compared with baseline (5-point scale: much better, better, same, worse, much worse); average pain severity over the past 3 days (0–10 numerical rating scale); severity rating of patient-nominated main problem over the past 3 days (0–10 numerical rating scale) (25); number of days lost from paid employment since last assessment; and quality of life using the Short Form 12 physical component score and mental component score (26). Treatment outcomes included satisfaction with physiotherapy treatment (5-point scale: strongly disagree, disagree, not sure, agree, strongly agree); side effects of treatment; adverse events; and cointerventions.

Objectives. The primary objective was to compare at 6 months the effect of adding manual therapy or PSWD with advice and exercise alone in patients with neck disorders referred directly from primary care. The secondary objective was a comparison of early effectiveness at 6 weeks.

Sample size. The sample size calculation was based on the primary outcome measure, the Northwick Park Neck Pain Questionnaire. A 0–6-month change in the Northwick Park score of 5 points was considered a clinically relevant change (7,24). To detect a mean difference in the 0–6-month change in Northwick Park scores of 5 points (SD 12.5) at a 5% significance level (two-tailed) and with 80% power, a minimum of 99 patients were needed in each arm of the study. A total of 350 participants were therefore required to allow for loss to followup.

Statistical methods. Analysis was by intention to treat. Collection of data and statistical analysis were performed

Table 1. Baseline characteristics of participants, randomized according to treatment group*

	Advice and exercise (n = 115)†	Manual therapy (n = 114)†	PSWD (n = 121)†
Demography			
Age, mean (range) years	50.5 (23–84)	52.8 (24–83)	50.3 (23–77)
Sex, female, no. (%)	63 (55)	77 (68)	81 (67)
Routine and manual occupations, no. (%)	50 (51)	49 (49)	47 (47)
Currently employed, no. (%)	68 (59)	67 (59)	68 (56)
Time off work during last 3 months as a result of neck problem, no. (%)	20 (29)	22 (33)	18 (27)
Neck pain and function			
Northwick Park score, mean (range)	36.6 (5.6–75.0)	38.6 (11.1–80.6)	36.9 (5.6–75.0)
Pain severity last 3 days, mean (range)	4.6 (0–10)	5.4 (0–10)	5.0 (0–10)
Severity of main problem, mean (range)	5.0 (0–10)	5.6 (0–10)	5.0 (0–10)
Painkillers in past 48 hours, no. (%)	45 (39)	63 (55)	60 (50)
First episode, no. (%)	46 (43)	37 (34)	36 (31)
Duration of pain >3 months, no. (%)	88 (77)	96 (84)	86 (71)
Previous neck injury, no. (%)	24 (26)	24 (27)	33 (33)
Prevous physical therapy, no. (%)	30 (27)	46 (41)	47 (39)
General health			
Widespread pain, no. (%)	18 (16)	25 (22)	24 (20)
Chronic widespread pain, no. (%)	13 (11)	24 (21)	19 (16)
SF-12 PCS score, mean (range)	41.3 (6.3–61.9)	39.2 (13.6–58.8)	41.9 (14.2–61.0)
SF-12 MCS score, mean (range)	49.4 (12.6–70.2)	48.9 (13.7–67.1)	48.2 (18.6–66.9)

* PSWD = pulsed shortwave diathermy; routine and manual occupations = categories 5–7 according to the National Statistics Socio-economic Classification (NS-SEC) based on the Standard Occupational Classification (27); First episode = patient's first episode of neck pain; widespread pain = American College of Rheumatology definition (28); chronic widespread pain = American College of Rheumatology definition plus >3 months' duration; SF-12 = Short-Form 12; PCS = physical component score; MCS = mental component score.
† This includes the 4 subsequently ineligible participants with contraindications to the study treatments.

blind to treatment allocation. We used *t*-tests to analyze numerical data and chi-square tests for categorical data. Adjusted analyses were performed where appropriate to control for random differences in baseline measures using analysis of variance and logistic regression, as appropriate.

To examine the effect of possible bias due to loss to followup, we carried out a sensitivity analysis using 2 different approaches to account for missing values of the primary outcome. The first approach was to assume no change in patient's outcome (i.e., impute all missing values as change scores of 0). The second approach was to assume complete recovery in each case (i.e., impute baseline scores as the change scores, representing the maximum possible improvement).

Statistical significance was set at the 5% level (two-tailed). Statistical analyses were carried out using SPSS for Windows version 11.0 (Chicago, IL). The trial was monitored by an independent Data Monitoring and Ethics Committee. No interim analyses were undertaken during the study period.

RESULTS

Recruitment and followup. Potential participants (n = 735) were screened between July 2000 and June 2002; 350 (48%) were eligible and consented to being randomized, 210 (28%) were ineligible, and 175 (24%) did not consent. The most common categories for ineligibility were medicolegal claim (23%), neck pain better (18%), and unable to contact (7%). Of the 350 participants, 115 were randomized to advice and exercise alone, 114 to manual therapy, and 121 to PSWD. Four randomized participants were found to have contraindications to the study interventions by the treating physical therapists and were excluded from followup assessment. Followup assessments were completed for 317 (92%) participants at 6 weeks and 321 (93%) at 6 months. Numbers of randomized participants ranged from 4 to 64 patients per physical therapy department. Figure 1 illustrates the progress of participants through the trial.

Baseline characteristics. Table 1 shows the baseline characteristics of randomized participants. Mean age was 51 years (range 23–84 years) and 63% were women. Baseline characteristics were similar between groups, but there were more men in the advice and exercise group, and the manual therapy group had a slightly higher average age and severity of neck problems. The table includes the 4 participants excluded from treatment mentioned above. The numbers subsequently eligible for analysis were 113 for advice and exercise alone, 113 for advice and exercise plus manual therapy, and 120 for advice and exercise plus PSWD.

External validity. Treatment allocation and baseline characteristics were similar across highest (more than 25 patients recruited) and lowest (fewer than 25 patients recruited) recruiting physical therapy departments. Patients

Table 2. Summary of interventions by treatment group from 340 case notes audited*

	Advice and exercise (n = 110)	Manual therapy (n = 111)	PSWD (n = 119)
No. who received their allocated treatment (%)	109 (99)	108 (97)	115 (97)
No. of physical therapy visits, median (IQR)	3 (2–4.25)	5 (4–7)	6 (5–7)
Duration of treatment, median (IQR) days	27 (16–49)	35 (23–49)	34.5 (21–48.25)

* PSWD = pulsed shortwave diathermy; IQR = interquartile range.

in the highest recruiting departments had a mean Northwick Park score of 36.2 compared with 39.3 for those in the lowest recruiting departments.

Interventions. Case notes were audited for 340 of the 346 eligible patients: 332 (98%) of 340 were recorded as having received their allocated treatment (see Table 2). Attendance was good and was similar across treatment groups. The number of treatment visits was significantly lower and the overall duration of treatment was shorter in the advice and exercise group. In total, there were 1,607 physical therapy visits, with education and advice recorded in 619 (39%) and exercise in 1,154 (72%). The most commonly recorded treatments in the manual therapy group were joint mobilization techniques (357 [63%]) and soft tissue techniques (216 [38%]). The average recorded dosages in PSWD were median power 7.4W (interquartile range [IQR] 6–12W) and median treatment time 15 minutes (IQR 15–20 minutes). There were no serious adverse events reported in any of the intervention groups.

Table 3. Participants' Northwick Park scores and global assessment of overall change at 6 weeks' and 6 months' followup by treatment group

	Advice and exercise	Manual therapy	PSWD*
Northwick Park scores			
6 weeks			
Score, mean ± SD	25.6 ± 17.6	29.6 ± 15.5	28.9 ± 15.5
Change score, mean ± SD†	10.1 ± 12.6	8.7 ± 12.1	7.7 ± 10.8
Difference, mean (95% CI)‡			
Crude	–	1.5 (−2.0, 4.9)	2.5 (−0.8, 5.7)
Adjusted§	–	1.8 (−1.6, 5.2)	2.6 (−0.6, 5.9)
6 months			
Score, mean ± SD	24.2 ± 18.6	27.8 ± 19.4	26.9 ± 18.7
Change score, mean ± SD†	11.5 ± 15.7	10.2 ± 14.1	10.3 ± 15.0
Difference, mean (95% CI)‡			
Crude	–	1.4 (−2.8, 5.5)	1.3 (−2.9, 5.5)
Adjusted§	–	1.4 (−2.7, 5.5)	1.9 (−2.4, 6.1)
Global assessment of overall change			
6 weeks, no. of completed assessments	99	106	111
Much better, no. (%)	27 (27)	33 (31)	24 (22)
Better, no. (%)	34 (34)	43 (41)	52 (47)
Same, no. (%)	33 (33)	24 (23)	26 (23)
Worse, no. (%)	5 (5)	6 (6)	8 (7)
Much worse, no. (%)	0 (0)	0 (0)	1 (1)
6 months, no. of completed assessments	100	109	112
Much better	31 (31)	36 (33)	31 (28)
Better	34 (34)	26 (24)	38 (34)
Same	26 (26)	35 (32)	34 (30)
Worse	8 (8)	10 (9)	6 (5)
Much worse	1 (1)	2 (2)	3 (3)

* PSWD = pulsed shortwave diathermy.
† Change in Northwick Park score compared with baseline (primary outcome).
‡ Difference in mean Northwick Park change scores (95% confidence interval) compared with the advice and exercise group (mean change score for advice and exercise group minus mean change score for manual therapy group/PSWD group).
§ Mean difference adjusted for baseline age, sex, Northwick Park score, and duration of pain.

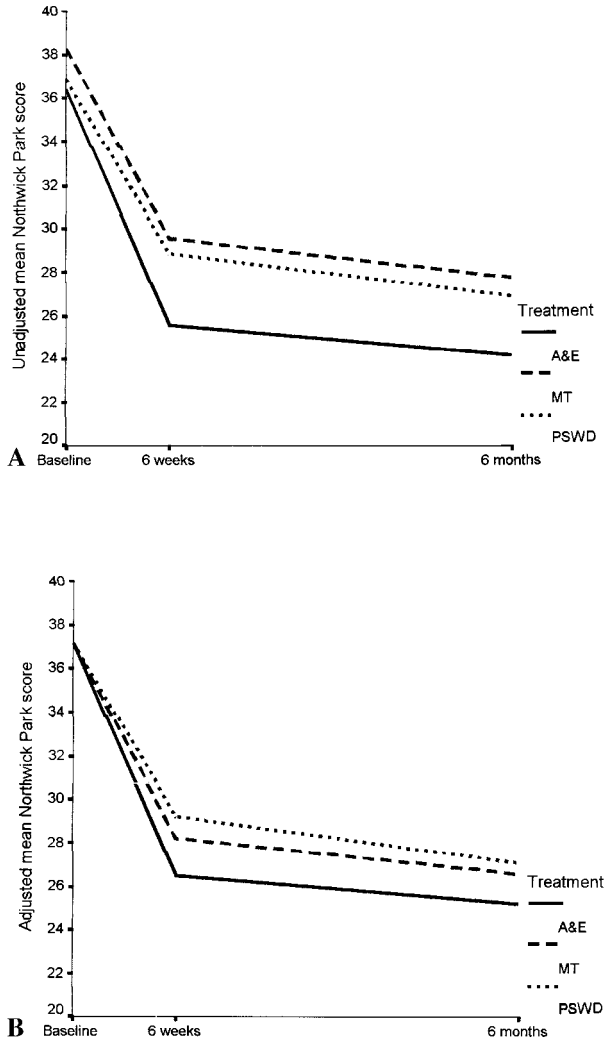

Figure 2. Mean Northwick Park scores at baseline, 6 weeks, and 6 months. **A,** Nonstandardized; **B,** Standardized, adjusted for baseline age, sex, Northwick Park score, and duration of pain. A&E = advice and exercise; MT = manual therapy plus advice and exercise; PSWD = pulsed shortwave diathermy plus advice and exercise.

Primary outcome. The mean ± SD reduction in Northwick Park score at 6 months was 11.5 ± 15.7 for advice and exercise alone, 10.2 ± 14.1 for advice and exercise plus manual therapy, and 10.3 ± 15.0 for advice and exercise plus PSWD. The mean ± SD reduction in Northwick Park score at 6 weeks was 10.1 ± 12.6 for advice and exercise alone, 8.7 ± 12.1 for advice and exercise plus manual therapy, and 7.7 ± 10.8 for advice and exercise plus PSWD (Table 3). There were no statistically significant differences in mean changes between the advice and exercise group and either of the other 2 groups at each time point (crude and adjusted). Figure 2 illustrates the changes in the Northwick Park scores during followup.

Sensitivity analysis. After replacing missing Northwick Park change scores with no change in patient's outcome or complete recovery in each case, there were no statistically significant differences between the advice and exercise group and either of the other 2 groups.

Secondary outcomes. Table 3 shows participants' global assessment of change in neck problems compared with baseline. The other secondary outcomes are shown in Table 4.

Subgroup analysis. Exploratory subgroup analysis did not show any significant differences in mean fall in Northwick Park score between any of the interventions for subgroups stratified according to age, sex, baseline Northwick Park score, and symptom duration.

Cointerventions. There were significantly fewer additional consultations with general practitioners in the advice and exercise alone group (Table 4).

DISCUSSION

We report the findings from a large, multicenter, pragmatic randomized controlled trial in UK physical therapy departments investigating the effectiveness of commonly used treatments for nonspecific neck pain. Our study demonstrated no additional benefit from adding either manual therapy or PSWD to a package of advice and exercise alone, as delivered by musculoskeletal physical therapists.

Points of internal validity include adequate recruitment, a remote system of randomization, and high levels of followup (93% followup at 6 months). The allocated treatment was received by 98% of the participants and was delivered in accordance with the study protocol. Outcomes were assessed blind to treatment allocation and analysis was by intention to treat. We chose a primary outcome measure of relevance to the patient (neck-specific disability) and appropriate for use in a primary care population.

The use of broad eligibility criteria, based on the red flag approach to classification (5), enabled us to include participants with a large range of nonspecific neck pain problems in our trial, typical of those referred to physical therapists in the UK by general practitioners. Beyond distinguishing serious from nonserious neck pain, other clinical subgroups were not identified. It is increasingly recognized that nonspecific spinal pain is not a homogeneous group but encompasses subsets of patients with different clinical diagnoses, prognoses, and responses to treatment (29), but in reality a precise clinical diagnosis is often impossible to reach (30). An alternative approach—namely subsetting patients based on risk factors for recurrence or differential response to various treatment modalities—is currently being evaluated for low back pain (31–34) but has not been extensively investigated for neck pain.

Our trial addressed a clinical question that has been highlighted as being of importance to patients, practitioners, and commissioners of health care (21). The relevance of our trial to clinical practice was enhanced by the involvement of clinical physical therapists throughout the trial, from protocol development (20) to delivering the interventions.

Comparisons between our study and others are difficult because of heterogeneity of patient populations, contrast-

Table 4. Other secondary outcome measures at 6 weeks' and 6 months' followup, by treatment group*

	Advice and exercise	Manual therapy	PSWD
Clinical outcomes			
Change in neck pain severity, mean ± SD			
6 weeks	1.2 ± 2.4	1.6 ± 2.1	1.1 ± 2.6
6 months	1.2 ± 2.5	1.8 ± 2.6	1.3 ± 2.8
Change in severity of main problem, mean ± SD			
6 weeks	1.3 ± 2.5	1.7 ± 2.4	1.0 ± 2.7
6 months	1.5 ± 2.8	2.0 ± 2.8	1.4 ± 2.8
Painkillers in past 48 hours, no. (%)			
6 weeks	28 (31)	57 (55)†‡	47 (43)
6 months	30 (32)	56 (54)†	56 (52)†‡
SF-12 PCS score, mean ± SD			
6 weeks	44.5 ± 10.5	40.8 ± 11.8†	43.1 ± 9.7
6 months	43.7 ± 12.1	41.8 ± 12.3	42.2 ± 11.2
SF-12 MCS score, mean ± SD			
6 weeks	50.6 ± 9.5	49.7 ± 9.3	49.5 ± 10.4
6 months	49.7 ± 10.3	49.6 ± 10.0	50.2 ± 9.4
Time off work from baseline to 6 months, no. (%)			
0–6 months	11 (21)	9 (16)	15 (28)
Treatment outcomes			
Satisfied with treatment, no. (%)			
6 weeks	57 (66)	91 (89)†‡	81 (77)
Cointerventions§			
Received extra physical therapy treatment,¶ no. (%)			
0–6 months	12 (11)	11 (10)	19 (16)
Consultation with GP, no. (%)			
0–6 months	8 (10)	20 (22)†	21 (22)†‡
Received prescription from GP, no. (%)			
0–6 months	25 (30)	34 (37)	34 (35)
Bought OTC medicines, no. (%)			
0–6 months	39 (48)	37 (40)	45 (45)
Consultation with other health professional, no. (%)			
0–6 months	16 (20)	20 (22)	11 (12)

* PSWD = pulsed shortwave diathermy; SF-12 = Short-Form 12; PCS = physical component score; MCS = mental component score; GP = general practitioner; OTC = over the counter.
† $P < 0.05$ for PSWD/manual therapy versus advice and exercise using *t*-tests for numerical variables and chi-square tests for categorical variables.
‡ $P < 0.05$ for PSWD/manual therapy versus advice and exercise using linear regression for numerical variables and logistic regression for categorical variables, adjusting for baseline age, sex, Northwick Park score, and duration of pain.
§ Related to neck problem.
¶ As stated on the physical therapists' case report forms (all other measures were self-completed in the followup questionnaires).

ing content and administration of interventions, and different outcome measures. A recent high-quality trial by Hoving et al (35) demonstrated improved short-term outcome for manual therapy compared with usual GP care in patients with nonspecific neck pain. At 7 weeks, "complete recovery or much improvement" was reported by 68% of participants with nonspecific neck pain who received manual therapy, compared with 36% of those allocated to usual GP care (35). Our study did not investigate the effectiveness of manual therapy alone. We have clearly demonstrated, however, no additional benefit of manual therapy over a package of advice and exercise delivered by experienced musculoskeletal physical therapists.

Gross et al (10), in a recent systematic review, highlighted the overall evidence favoring multimodal care (manual therapy with exercises) over manual therapy alone. High-technology exercises or manual therapy in conjunction with low-technology exercises were more effective in the long term than manipulation alone in patients with chronic mechanical neck pain (36). Participants in the study of Bronfort et al (36) reported higher satisfaction in the manipulation and exercise group compared with the other 2 groups. We also found higher patient satisfaction in those receiving manual therapy at 6 weeks, although there were no differences in clinical outcome.

Our study was not designed to provide evidence for the effectiveness of advice and exercise, our comparator group, for nonspecific neck pain. The exercise program in our study was low-tech in comparison with other programs; it was based on a menu of selected exercises that patients could easily carry out at home. Interestingly, participants in the group receiving advice and exercise alone reported fewer consultations with their GPs for their neck pain and were taking less medication at the 6-month followup assessment. Advice and exercise seems an attractive approach to the management of nonspecific neck disorders. Although there is a lack of specific evidence for the

efficacy of advice and exercise in the treatment of neck pain (37), there is good evidence to support its use as part of the management of many musculoskeletal conditions, such as osteoarthritis (38), and it forms the cornerstone of physical therapy practice in the UK.

Our findings demonstrated that for patients with nonspecific neck pain referred to physical therapy from primary care, neither manual therapy nor PSWD conferred any additional clinical benefit over a short course of active physical treatment incorporating an advice and exercise package delivered by experienced musculoskeletal physical therapists. Advice and exercise alone reduced subsequent primary care consultation, although patient satisfaction levels were lower than those recorded when manual therapy was added. These findings have important implications for physical therapy practice.

ACKNOWLEDGMENTS

We would like to thank our collaborators; participating physical therapists, therapy managers, and physical therapists involved in protocol development (full listing of names available at http://www.keele.ac.uk/depts/pcs/panther/htm); Hilary Jones for secretarial support; Marilyn James; and members of the Data Monitoring and Ethics Committee and the Birmingham Clinical Trials Unit.

REFERENCES

1. Valkenburg HA, Laar A, van Hofman A, Haanen HCM. Nek-en lage rugklachten. Zesde voortgangsverslag van het epidemiologisch preventief onderzoek. Zoetermeer: Instituut Epidemiologie; 1980. p. 99–109.
2. Aker PD, Gross AR, Goldsmith CH, Peloso P. Conservative management of mechanical neck pain: systematic overview and meta-analysis. BMJ 1996;313:1291–6.
3. Borghouts JA, Koes BW, Bouter LM. The clinical course and prognostic factors of non-specific neck pain: a systematic review. Pain 1998;77:1–13.
4. Bogduk N, Lord SM. Cervical spine disorders. Curr Opin Rheumatol 1998;10:110–5.
5. Croft P. Diagnosing regional pain: the view from primary care. Baillieres Best Pract Res Clin Rheumatol 1999;13:231–42.
6. Robert G, Stevens A. Should general practitioners refer patients directly to physical therapists? Br J Gen Pract 1997;47:314–8.
7. David J, Modi S, Aluko AA, Robertshaw C, Farebrother J. Chronic neck pain: a comparison of acupuncture treatment and physiotherapy. Br J Rheumatol 1998;37:1118–22.
8. Gross AR, Aker PD, Goldsmith CH, Peloso P. Conservative management of mechanical neck disorders. Part two: physical medicine modalities (Cochrane review). The Cochrane Library ed. Oxford: Update Software; 1998.
9. Hurwitz EL, Aker PD, Adams AH, Meeker WC, Shekelle PG. Manipulation and mobilization of the cervical spine: a systematic review of the literature. Spine 1996;21:1746–60.
10. Gross AR, Kay T, Hondras M, Goldsmith C, Haines T, Peloso P, et al. Manual therapy for mechanical neck disorders: a systematic review. Man Ther 2002;7:131–49.
11. Gross AR, Kay TM, Kennedy C, Gasner D, Hurley L, Yardley K, et al. Clinical practice guideline on the use of manipulation or mobilization in the treatment of adults with mechanical neck disorders. Man Ther 2002;7:193–205.
12. Wagstaff P, Wagstaff S, Downey M. A pilot study to compare the efficacy of continuous and pulsed magnetic energy (shortwave diathermy) on the relief of low back pain. Physiotherapy 1986;72:563–6.
13. Pope GD, Mockett SP, Wright JP. The survey of electrotherapeutic modalities: ownership and use in the NHS in England. Physiotherapy 1995;81:82–91.
14. Scott S. Shortwave diathermy. In: Kitchen S, Bazin S, editors. Clayton's electrotherapy. 10th ed. London: WB Saunders; 1996. p. 154–78.
15. Foley-Nolan D, Barry C, Coughlan RJ, O'Connor P, Roden D. Pulsed high frequency (27MHz) electromagnetic therapy for persistent neck pain: a double blind, placebo-controlled study of 20 patients. Orthopedics 1990;13:445–51.
16. Foley-Nolan D, Moore K, Codd M, Barry C, O'Connor P, Coughlan RJ. Low energy high frequency pulsed electromagnetic therapy for acute whiplash injuries: a double blind randomized controlled study. Scand J Rehabil Med 1992;24:51–9.
17. Kitchen S, Partridge C. Review of shortwave diathermy continuous and pulsed patterns. Physiotherapy 1992;78:243–52.
18. Low J. Dosage of some pulsed shortwave clinical trials. Physiotherapy 1995;81:611–6.
19. Hill J, Lewis M, Mills P, Kielty C. Pulsed short-wave diathermy effects on human fibroblast proliferation. Arch Phys Med Rehabil 2002;83:832–6.
20. Sim J, Dziedzic K, Hay EM. Physiotherapy and the randomized controlled trial: an evaluation of research and development workshops in musculoskeletal physiotherapy. J Eval Clin Pract 1999;5:437–41.
21. Chartered Society of Physiotherapy. Priorities for physiotherapy research: 1997: results of a consultation exercise. London: Chartered Society of Physiotherapy; 1998.
22. Hay EM, Dziedzic K, Sim J. Treatment options for regional musculoskeletal pain: what is the evidence? Bailliere's Best Pract Res Clin Rheumatol 1999;13:243–59.
23. Chartered Society of Physiotherapy. Guidelines of good practice in electrotherapy. London: Chartered Society of Physiotherapy; 1998.
24. Leak AM, Cooper J, Dyer S, Williams KA, Turner-Stokes L, Frank AO. The Northwick Park Neck Pain Questionnaire, devised to measure neck pain and disability. Br J Rheumatol 1994;33:469–74.
25. Beurskens AJ, de Vet HC, Koke AJ, Lindeman E, Regtop W, van der Heijden GJ, et al. Efficacy of traction for non-specific low back pain: a randomised clinical trial. Lancet 1995;346:1596–600.
26. Ware J Jr, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. Med Care 1996;34:220–33.
27. Office for National Statistics. The National Statistics Socio-Economic Classification. London: HMSO; 2002.
28. Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, Goldenberg DL, et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia: report of the multicenter criteria committee. Arthritis Rheum 1990;33:160–72.
29. Kent P, Keating J. Do primary-care clinicians think that nonspecific low back pain is one condition? Spine 2004;29:1022–31.
30. Deyo RA. Diagnostic evaluation of LBP: reaching a specific diagnosis is often impossible. Arch Intern Med 2002;162:1444–7.
31. Fritz JM, Delitto A, Erhard RE. Comparison of classification-based physical therapy with therapy based on clinical practice guidelines for patients with acute low back pain: a randomized clinical trial. Spine 2003;28:1363–71.
32. Werneke MW, Hart DL. Categorizing patients with occupational low back pain by use of the Quebec Task Force Classification system versus pain pattern classification procedures: discriminant and predictive validity. Phys Ther 2004;84:243–54.
33. McCarthy CJ, Arnall FA, Strimpakas N, Freemont AJ, Oldham JA. The bioclassification of non-specific low back pain: a systematic review. Phys Ther Rev 2004;9:17–30.
34. Petersen T, Olsen S, Laslett M, Thorsen H, Manniche C,

Ekdahl C, et al. Inter-tester reliability of a new diagnostic classification system for patients with non-specific low back pain. Aust J Physiother 2004;50:85–94.
35. Hoving JL, Koes BW, de Vet HC, van der Windt DA, Assendelft WJ, van Mameren H, et al. Manual therapy, physical therapy, or continued care by a general practitioner for patients with neck pain: a randomized, controlled trial. Ann Intern Med 2002;136:713–22.
36. Bronfort G, Evans R, Nelson B, Aker PD, Goldsmith CH, Vernon H. A randomized clinical trial of exercise and spinal manipulation for patients with chronic neck pain. Spine 2001;26:788–99.
37. Sarig-Bahat H. Evidence for exercise therapy in mechanical neck disorders. Man Ther 2003;8:10–20.
38. Hurley MV. Muscle, exercise and arthritis. Ann Rheum Dis 2002;61:673–5.