

Title: Counterstrain manipulation in the treatment of Restless Legs Syndrome: a pilot single-blind randomised controlled trial; the CARL Trial.

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ABSTRACT

Objective

A single-blind randomised controlled trial was conducted to test the efficacy of Longden's counterstrain technique for restless legs syndrome (RLS) and the feasibility of the trial methodology.

Methods

Participants were adults with moderate to severe and persistent RLS, randomized to receive either active or control intervention. The control intervention (B) involved Counterstrain manipulation applied to the lower half of the body. The active intervention (A) was identical to the control intervention plus specific modifications to treat RLS as described by Longden. The success of blinding of participants was confirmed by a questionnaire.

Results

Thirty-nine patients entered the trial, 20 assigned to Group A and 19 to Group B. All patients were included in the intention to treat analysis. The primary outcome measure, the change on the International Restless Legs Scale (IRLS) total score at six weeks, showed a statistically significant difference of 8.06 points (95% CI 3.15 - 12.96) between groups. This represented an improvement of 42.2% in the active group compared to 8.7% in the controls. No adverse effects were reported.

Conclusions

Longden's RLS-specific Counterstrain treatment had a clinically important effect at six weeks. Trials of longer term effects and comparison with the standard drug regimes are now required.

Introduction

Restless Legs Syndrome (RLS), described by Ekbom in 1945, is a condition characterized by a strong inclination to move limbs, usually the legs, that comes on most frequently in bed at night but may occur at rest while sitting. Movement temporarily alleviates the symptoms but the resulting interference with sleep or sitting can be inconvenient and exhausting³. The condition is usually persistent once established⁴⁻⁶. The prevalence of the condition has been reported to be as great as 2.7% of the general population suffering moderate or severe symptoms 2 – 3 times per week⁷⁻⁹. The clinical features of a symmetrical movement disorder with no local neurological abnormality has suggested a central mechanism although a distinction from other such disorders is that the movement is not totally involuntary: while the final form it takes is voluntary, the impulse to move is neither desired nor deniable. Treatment has generally been by centrally-acting classes of drugs: dopamine agonists eg. pergolide¹⁰ and ropinirole¹¹, benzodiazepines such as clonazepam, anticonvulsants or opioids. Partial suppression of the symptoms can be achieved during treatment with relapse usual when the drug is discontinued. Counterstrain is a manual treatment method discovered by Jones¹², a US osteopathic physician. The procedure involves locating the specific tender 'Jones' points in the

body, moving the body or limb into a position that reduces tenderness in the point, and maintaining that position for ninety seconds before slowly returning the region to anatomical neutral. While Jones used the treatment for musculoskeletal pain and impairment, Longden discovered that certain Jones points on the pelvis appeared to be specific to RLS [12](#), and treatment of them could relieve RLS symptoms. Longden's technique was tested by Peters in a case series of twenty volunteer participants with RLS [13](#) and the findings suggested that a course of four treatments might provide substantial symptom relief which may persist after completion of the course of treatment. A randomized trial was therefore planned in order to investigate the short-term specific efficacy of this method. The trial was titled CARL, Counterstrain Assessed for Restless Legs.

Methods

The study was designed as a pilot, single-blind, randomized controlled trial to test the specific efficacy of Longden's technique. Ethical approval for the protocol was obtained from the London College of Osteopathic Medicine Research Ethics Committee. The trial took place at the Osteopathic Association Clinic in central London and adhered to the published protocol [14](#) which is outlined below.

Recruitment: Participants were volunteers recruited between October 2009 and December 2010 through advertisements on a RLS support group dedicated web-site and in a free local daily newspaper.

The eligibility criteria were a positive diagnosis on the International Restless Legs Syndrome Study Group diagnostic criteria, [15](#) aged 18 years and over; moderate to severe symptoms defined as a total score of 14 or more on the International Restless Legs Scale (IRLS) [16](#); and a consistent level of RLS symptoms for at least 3 months.

The exclusion criteria were an age of less than 18 years; an IRLS score of less than 14; remission of RLS in the past 3 months; the presence of contra-indications to the treatment such as hip pathology; current use of drugs known to precipitate RLS such as antidepressants; or factors associated with RLS such as uraemia or iron deficiency anaemia.

All those responding to advertisements were contacted and a preliminary screening for eligibility was conducted. Those interested in participation and potentially eligible were sent the Patient Information Sheet for the trial and invited for a clinical assessment in which they were screened fully for eligibility. For eligible subjects, the implications of entry to the trial were discussed, any resulting questions fully answered, and written consent requested. Those consenting were formally entered into the trial.

Randomization and masking: Sealed envelope randomization was used: a stack of forty sealed envelopes contained equal numbers of A (active) or B (sham) allocations. The envelopes were sequentially numbered on the outside with a study ID after being shuffled for twenty minutes to ensure random distribution. After trial entry the next envelope in the series was drawn by the researcher [RM] and opened in an adjacent room, the participants's ID and treatment allocation were recorded in the trial log and the treating clinician [TP] was informed of the allocation. Treatment according to allocation was then carried out by the clinician who refrained from discussing the specific purpose of each part of the procedure, in order to maintain blinding. The timing of appointments and the waiting area arrangement precluded subjects discussing their treatments with each other. A short post-treatment questionnaire was used to assess whether blinding was successful.

Intervention: All participants were offered four weekly sessions of manual treatment within nine weeks of trial entry, carried out by one osteopathic physician [TP]. The control intervention (B) involved Counterstrain applied to the lower half of the body treating any positive (tender) Jones points found, but avoiding Longden's RLS-specific points. The active intervention (A) was identical to the

control intervention, except that Longden's RLS-specific points were treated, and this was reinforced by a self-treatment procedure to the same points. The self-treatment was for home use and aimed to duplicate the administered technique in that the patient monitored by palpation the tenderness of their Longden's points and reduced tenderness by positioning themselves. To maintain blinding, they were simply told that this was an exercise often used for RLS.

Those taking drugs for RLS were told that should they experience a major reduction in symptoms they could, in consultation with their clinician, progressively reduce their dosage and report this to the researchers.

Assessment and outcome measures:

The primary outcome measure was the International Restless Legs Scale [IRLS] total score: a ten question report of patient symptom severity, scored with increasing severity from 0 to 40. The reliability of the IRLS had been tested 16 and found to be internally consistent, valid and reliable.

Secondary outcome measures were:

1. Sleep loss: patient reported average hours lost per night due to RLS in the last five days.
2. Patient Specific Outcome Score [PSOS]: a study-specific measure of improvement for which the patient nominated, at baseline, up to three goals for treatment and assigned weights to their importance; at six weeks after entry, linear analogue scales were used to capture their view of the degree to which they had achieved their goal(s), and a weighted score computed.
3. Global Improvement Scale [CGI-I]: a patient-completed six point scale of overall change 17.
4. Drug usage for RLS symptoms.

The IRLS, sleep loss and drug usage were completed at base-line. Follow-up questionnaires of CGI-I and sleep loss were completed at home five days after first attendance and then on the same day each week for six weeks. These were held in a bound book that retained pressure sensitive duplicates of the forms after the top copy was removed to be returned at the next clinic attendance or by post (in reply-paid addressed envelopes). IRLS and PSOS were completed at week six only. Questionnaires not received within a week of the expected date were followed up by telephone or email to elicit any obstacles to compliance. The integrity of the patients' scores was ensured not only by secure storage of returned questionnaires at the research centre, but also by asking each patient to retain safely the bound 'questionnaire book' containing the duplicate copies of their responses, and to make it available only to an independent auditor of the research integrity.

Adverse effects were monitored at the weekly face-to-face contacts with the clinician and the researcher, and by telephone follow-up at eight weeks after entry. No persisting side-effects of Counterstrain had been previously reported to permit design of a structured record form.

Analysis:

The mean scores at each time point were computed for Group A and Group B, on an intention to treat basis. The change in scores from baseline to six weeks after entry were computed for IRLS and sleep loss, for each participant. The difference in mean scores between groups, with confidence intervals, were then computed, and using analysis of variance methods, differences between the improvements in group A compared with group B were compared (unpaired t tests, 2 tailed). The mean CGI-I score at 6 weeks was compared between groups. The primary outcome measure was the mean change in IRLS score from 0- 6 weeks. In the intention to treat analysis, the scores at week six were imputed if a score was available for week 5. Otherwise, patients with a missing score were omitted from

summary statistics for that measure. A sensitivity analysis was conducted [18](#) using different more conservative assumptions: if scores were missing then no change from baseline was assumed, and all patients were included in the analysis.

Power Calculation: As this was a pilot trial, formal estimates of the power of the study were not made.

Results

The flow of patients into the trial is shown in Figure 1. The response to advertising the trial was brisk, with 241 people responding to advertisements. Of these, 120 volunteered sufficient information by telephone or email for the initial screening for eligibility, which found 64 (53%) potentially eligible. They then attended and were assessed by the clinician who found 39 (32.5%) fulfilled the eligibility criteria for the trial. They were formally invited and all 39 consented to enter the trial.

Twenty patients were randomized to the active intervention arm A and 19 patients to control arm B. The baseline characteristics of the two groups were similar (see Table 1). Ages ranged from 24-76 years with a mean of over 50 years. Sleep loss ranged from 0-5.5 hours. The IRLS score ranged from 16-35 with a mean score of over 20. In Group A 63% of participants had a family history of RLS compared with 42% in Group B. In Group B seven subjects were taking medication for their RLS: five ropinirole. Of the seven only one reduced their dose: one using ropinirole from 1.5 to 0.5 mgs daily. In Group A, two subjects were taking dopamine agonists and did not change dose during the study period.

Patients completed the questionnaires regularly and drop out was low (2 patients, 5% in total). In group A, one patient (ID 32) withdrew before any treatment; one patient (ID 21) dropped out after five weeks due to the onset of acute low back pain (of which she had a recurrent history); she had no six-week scores. In group B, there were no dropouts during the study period of 0-6 weeks, but a few patients failed to complete all the measures at 6 weeks, one patient (ID 15) had missing data for IRLS and PSOS; two patients (ID 9 and 37) had missing scores for sleep loss.

Blinding was assessed immediately after the first treatment using a 100mm linear analogue scale with one end representing total certainty of a Group A allocation and the other similar certainty of being in Group B. Nineteen participants (50%) recorded a score of 50 (total uncertainty). The remaining 50% participants had an impression of which group they were in, averaging 12mms from the midpoint, of which 11 were correct and 8 incorrect. These results are consistent with guessing.

Table 2 shows the main results. The IRLS score decreased between baseline and week six by 10.33 points in group A, compared to 2.28 points in group B. This represented an improvement of 42.2% in the active group compared to 8.7% in the controls. The difference between groups (the primary outcome measure) of 8.06 points (95% CI 3.15 to 12.96, $p=0.0021$) was highly statistically significant in favour of the active intervention. At six weeks, two of the secondary outcome measures also showed significant differences between groups: the patient-rated improvement (CGI-I) was 0.84 points greater in group A by (95%CI 0.12 to 1.56) compared to group B, and the Patient specific outcome score (PSOS) was 27.83 points higher in group A (95%CI 5.10 to 50.57). Sleep loss showed no significant difference between groups. Drug usage was low among the participants, and was not evaluated. The sensitivity analysis results were slightly less favourable to the active intervention but the primary outcome measure remained statistically significant. The change in IRLS score showed a difference between active and control arms of 7.14 (95%CI 2.39 to 11.89, $p=0.0043$). The PSOS scores at six weeks remained significant different ($p=0.041$) but the CGI-I scores were non-significantly different ($p=0.096$) between arms.

There were no adverse events reported from treatment; one patient dropped out at week five due to recurrence of a back pain problem.

Discussion

Although, as a pilot trial, results should be viewed with caution until confirmed by larger definitive studies, outcomes showed a highly significant short-term benefit from Counterstrain treatment of the RLS-specific points identified by Longden. The trial suggests the Longden technique may have specific efficacy, since the control intervention resembled the active intervention very closely, and differed only in the use of the RLS-specific points. Blinding appeared effective and drop-out was low, reducing the chance of bias. This is supported by the similarity of results from the sensitivity analysis.

The positive outcome of this trial of a manual treatment for RLS may stimulate debate about the aetiology and patho-mechanics of RLS, currently thought to be a disorder of the central nervous system. Further research into the mechanism of action of Counterstrain and the nature of the tender Jones points are also warranted.

Following a successful pilot, larger definitive studies should attract funding sufficient to allow group *allocation and data handling to be segregated from the clinicians managing the interventions and further assuring the integrity of the data. It cannot be ignored that there are credibility issues when a strong treatment effect is obtained by a method that must be implausible to neurologists and derives from a complementary therapy. Such issues may impede the adoption of the method and even its evaluation by established centres.*

In the intervention arm, Longden's RLS-specific points were treated both by the osteopathic physician and by the patient at home, therefore it is not possible to attribute the effect to one or both of these interventions. Another study would be needed to test the effects of physician treatment alone or the self-treatment regime alone. Due to small sample size, sub-group analyses were not possible. As the intervention was carried out by one practitioner, the results may be different if more practitioners were included. Adoption of the method generally would involve developing a training programme for therapists: on the other hand demonstration that patient self-treatment can be effective should lead to developing and evaluating a patient education programme.

This pilot trial has provided an estimate of parameters such as accrual and drop-out rates, which will inform the design of future trials. Further research is needed to confirm this positive finding and to investigate the duration of persistence of symptom relief, after the course of four treatments. If symptoms are relieved for some months, say, then manual treatment could offer a cost-effective alternative to lifelong medication (the annual drug cost being typically £400 per patient). For the 20% of patients who experience troublesome side effects from the medication [20](#), such an option could be welcome.

A meta-analysis of 14 trials of dopamine agonist treatment of RLS, [19](#) involving over 3,000 patients, indicated a weighted mean difference (WMD) of -4.93 IRLS points (95% CI, - 6.42 to -3.43; P<.001) between active and placebo groups. The difference of -8.06 IRLS points (-3.15 to -12.96; p 0.0021) in the CARL trial suggests that manual therapy could be comparable in effect size.

RLS is quite common (1-2% of the population), and often persists lifelong, with considerable impact on quality of life. This is the first reported trial of this manual technique for RLS. The results are encouraging and merit further investigation. In contrast to the usual care of RLS with centrally acting dopamine agonists, manual treatment has no side effects and, if relief of symptoms persists, could be a cost-effective alternative option for patients.

Personnel : Treatment was given by Dr Theo Peters [TP] a registered medical practitioner and osteopath who has been trained in the method developed by Dr Douglas Longden. Initial design of the study was by Dr Roderic MacDonald [RM] a registered medical practitioner with full osteopathic training. The analysis was planned and conducted by Dr Janine Leach, registered osteopath and

Senior Research Fellow at the University of Brighton. All authors took part in the preparation of this report for publication and agreed its final form.

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Conflicts of Interest: The clinicians involved in the trial could expect, in the future, to provide treatment and training involving the methods assessed should their worth be established.

References

1. Ekbom KA. Restless legs; a report of 70 new cases. *Acta Med Scand Suppl.* 1950; **246**: 64-8.
2. Ekbom KA. Restless legs (letter). *JAMA.* 1946; **131** (5): 481.
3. Leschziner G, Gringras P. Restless legs syndrome. *BMJ.* 2012; **344**: e3056.
4. Hening W, Allen R, Earley C, Kushida C, Picchiatti D, Silber M. The treatment of restless legs syndrome and periodic limb movement disorder. *An American Academy of Sleep Medicine Review. Sleep.* 1999; **22**(7): 970-99.
5. Walters AS, Hickey K, Maltzman J, Verrico T, Joseph D, Hening W, et al. A questionnaire study of 138 patients with restless legs syndrome: the 'Night-Walkers' survey. *Neurology.* 1996; **46**(1): 92-5.
6. Earley CJ, Silber MH. Restless legs syndrome: understanding its consequences and the need for better treatment. *Sleep Med.* 2010; **11**(9): 807-15.
7. Innes KE, Selfe TK, Agarwal P. Prevalence of restless legs syndrome in North American and Western European populations: a systematic review. *Sleep Med.* 2011; **12**(7):623-34.
8. Pereira Junior JC, Silva Neto JL, Pradella-Hallinan M. Restless legs syndrome in subjects with a knee prosthesis: evidence that symptoms are generated in the periphery. *Clinics (Sao Paulo).* 2011; **66**(11): 1955-9.
9. Yeh P, Walters AS, Tsuang JW. Restless legs syndrome: a comprehensive overview on its epidemiology, risk factors, and treatment. *Sleep Breath.* 2011.
10. Trenkwalder C, Hundemer HP, Lledo A, Swieca J, Polo O, Wetter TC, et al. Efficacy of pergolide in treatment of restless legs syndrome: the PEARLS Study. *Neurology.* 2004; **62**(8): 1391-7.
11. Trenkwalder C, Garcia-Borreguero D, Montagna P, Lainey E, de Weerd AW, Tidswell P, et al. Ropinirole in the treatment of restless legs syndrome: results from the TREAT RLS 1 study, a 12 week, randomised, placebo controlled study in 10 European countries. *J Neurol Neurosurg Psychiatry.* 2004; **75**(1): 92-7.
12. Jones LH. Spontaneous release by positioning. *The DO.* 1964; **4**: 109 -16.
13. Peters T. Restless legs. *Osteopathy Today.* 2002; **8**(8): 12-3.
14. MacDonald R, Peters T, Leach J. A randomised controlled trial of positional release manipulation (counterstrain) in the treatment of restless legs syndrome. *International Musculoskeletal Medicine.* 2011; **33** (1): 2125.
15. Allen RP, Picchiatti D, Hening WA, Trenkwalder C, Walters AS, Montplaisi J. Restless legs syndrome: diagnostic criteria, special considerations, and epidemiology. A report from the restless legs syndrome diagnosis and epidemiology workshop at the National Institutes of Health. *Sleep Med.* 2003; **4**(2): 101-19.
16. Walters AS, LeBrocq C, Dhar A, Hening W, Rosen R, Allen RP, et al. Validation of the International Restless Legs Syndrome Study Group rating scale for restless legs syndrome. *Sleep Med.* 2003; **4**(2): 121-32.
17. Berk M, Ng F, Dodd S, Callaly T, Campbell S, Bernardo M, et al. The validity of the CGI severity and improvement scales as measures of clinical effectiveness suitable for routine clinical use. *J Eval Clin Pract.* 2008; **14**(6): 979-83.
18. Hollis S, Campbell F. What is meant by intention to treat analysis? Survey of published randomised controlled trials. *BMJ.* 1999; **319**(7211): 670-4.
19. Baker WL, White CM, Coleman CI. Effect of nonergot dopamine agonists on symptoms of restless legs syndrome. *Ann Fam Med.* 2008; **6**(3): 253-62.
20. Allen RP, Ondo WG, Ball E, Calloway MO, Manjunath R, Higbie RL, et al. Restless legs syndrome (RLS) augmentation associated with dopamine agonist and levodopa usage in a community sample. *Sleep Med.* 2011; **12**(5): 431-9.

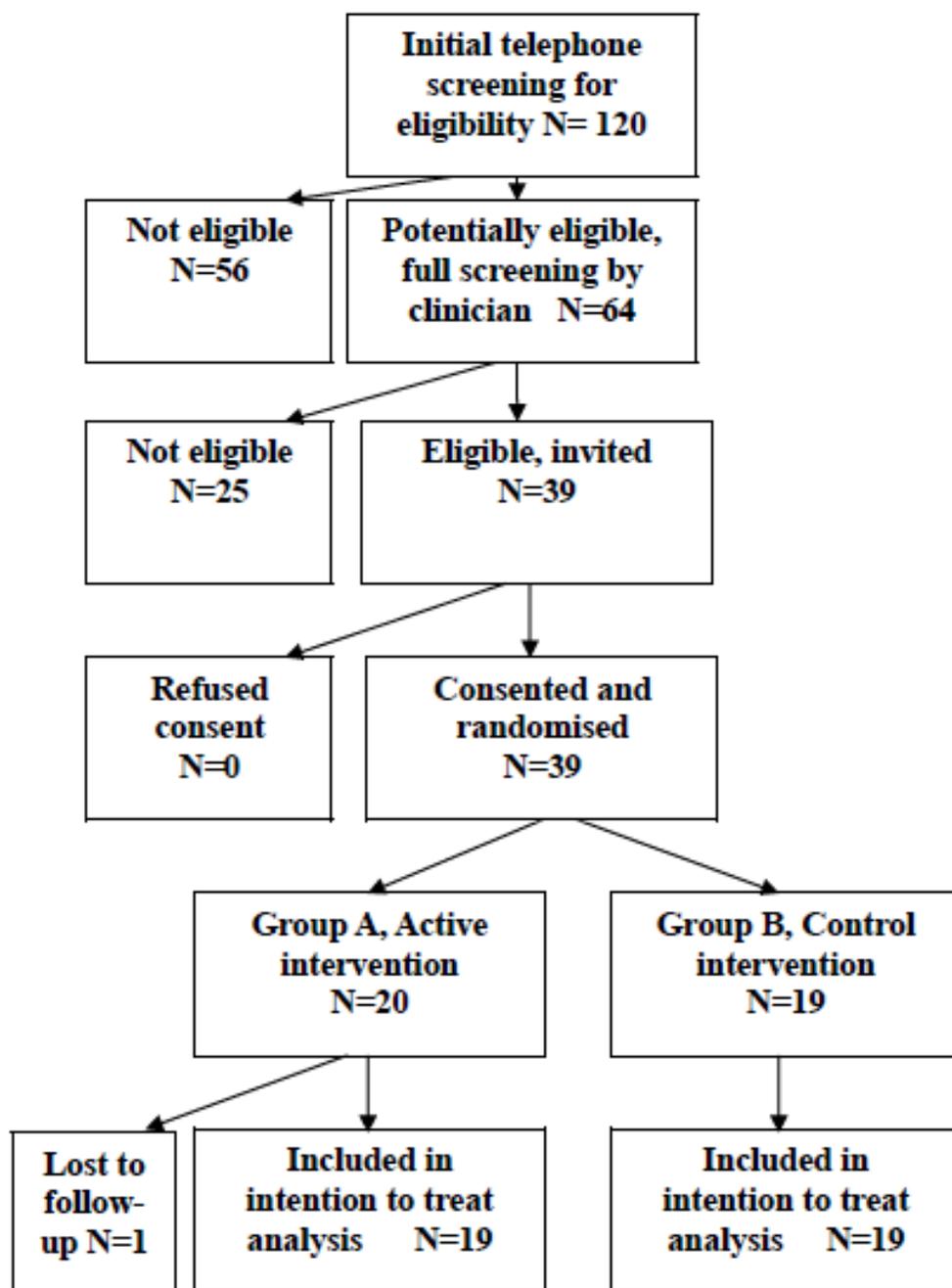
Table 1 Baseline characteristics of the 39 patients in the trial

Baseline characteristics	Active arm A	Control arm B
% Male	35%	32%
Age: mean (SD)	55.5 (13.9)	52.5 (11.3)
Age range (years)	24 to 76	28 to 72
Sleep loss in hours: mean (SD)	2.2 (1.2)	2.3 (1.5)
Sleep loss –Range (hours)	0.3 to 4.4	0 to 5.5
IRLS Score: mean (SD)	24.5 (4.9)	26.3 (5.4)
IRLS Score Range	17 to 32	16 to 35
Years since start of severe symptoms : mean (SD)	11.0 (12.9)	15.3 (16.0)

Table 2 Primary and secondary outcomes measures: changes from baseline to week 6

Outcome measure	Group A Active N=19	Group B Controls N=18	Difference A-B mean and 95%CI	P value
Primary outcome:				
Mean change in IRLS score (weeks 0-6)	-10.33	-2.28	-8.06 (-3.15 to -12.96)	0.0021
Secondary outcomes:				
Mean change in Sleep Loss (hours)	-0.95	-0.47	-0.48 (-1.09 to +0.129)	0.119
CGI-I at week 6	3.53	2.68	0.84 (0.12 to 1.56)	0.0228
PSOS at week 6	56.83	29.00	27.83 (5.10 to 50.57)	0.0179
IRLS at week 6	14.28	23.56	-9.28 (-14.98 to -3.57)	0.0022

Figure 1. Patient Flow diagram



This is a post-print version of an original article which has been peer reviewed and accepted by International Musculoskeletal Medicine [www.maney.co.uk] and is now in-press with a publication date in 2012 .

The protocol for this trial has been published and is accessible via <http://www.ingentaconnect.com/content/maney/imm/2011/00000033/00000001/art00005>