

Evidence to support osteopathic treatment of the cervical and thoracic spine - a summary table of osteopathic and osteopathic-relevant evidence

(May, 2016)

- Research relevant to osteopathic treatment of musculoskeletal pain comes from a number of healthcare professions, including osteopathy, chiropractic, physiotherapy, and medicine. Much of the research has focused on spinal manipulation and mobilization;
- In the management of the cervical and thoracic spine, a range of studies are presented looking at different symptom presentations. Studies looking at acute neck pain are included in entries 1-2; subacute and chronic neck pain studies are included in studies 3-9; and mixed studies are included in entries 10-15. Studies relating to the management of headache can be found in entries 16-22.
- In the summary of findings, the authors' conclusions are reported verbatim from the study. However, it is important to read the full text of the studies and critically review the findings to decide if you agree or challenge the authors' conclusions. Useful tools to help with critical appraisal can be found at <http://www.casp-uk.net/#!/casp-tools-checklists/c18f8>;
- Summaries of the individual studies are presented in the table below;
- Abbreviations are listed at the end of the table.

Number	Citation	Study characteristics	Study conclusions
1	<p>Leaver AM, Maher CG, Herbert RD, Latimer J, McAuley JH, Jull G, Refshauge KM. A randomized controlled trial comparing manipulation with mobilization for recent onset neck pain. Arch Phys Med Rehabil. 2010;91(9):1313-8. doi: 10.1016/j.apmr.2010.06.006. http://www.ncbi.nlm.nih.gov/pubmed/20801246</p>	<p>Study design: RCT; Study population: Patients with recent onset neck pain; Duration of symptoms: < 3 months; Sample size: N=182; Intervention: Neck manipulation; Comparator: Neck mobilisation; Outcome measures: The number of days taken to recover from an episode of neck pain; Outcome measurement interval: Information not available.</p>	<p>The authors concluded that “neck manipulation is not appreciably more effective than mobilization. The use of neck manipulation therefore cannot be justified on the basis of superior effectiveness”.</p>
2	<p>McReynolds TM, Sheridan BJ. Intramuscular ketorolac versus osteopathic manipulative treatment in the management of acute neck pain in the emergency department: a randomized clinical trial. J Am Osteopath Assoc. 2005;105(2):57-68. http://www.ncbi.nlm.nih.gov/pubmed/15784928</p>	<p>Study design: RCT; Study population: Patients with acute neck pain; Duration of symptoms: Acute; Sample size: N=58; Intervention: OMT; Comparator/Control: Intramuscular ketorolac; Outcome measures: An 11-point Numerical Rating Scale (NRS), and a 5-point Pain Relief Scale (PRS-5); Outcome measurement interval: Baseline and 1 hour post-treatment.</p>	<p>The authors concluded that “OMT is a reasonable alternative to parenteral nonsteroidal anti-inflammatory medication for patients with acute neck pain in the ED setting”.</p>

3	<p>Franke H, Franke J-D, Fryer G. Osteopathic manipulative treatment for chronic nonspecific neck pain: A systematic review and meta-analysis. <i>International Journal of Osteopathic Medicine</i> 2015; 18, 255-267. http://dx.doi.org/10.1016/j.ijosm.2015.05.003</p>	<p>Study design: Systematic review and meta-analysis; Study population: Patients with non-specific neck pain; Duration of symptoms: Chronic; Sample size: N=129; Intervention: OMT alone; OMT + sham ultrasound, and OMT+ standard care; Comparator/Control: physiotherapy, sham ultrasound, standard care + sham OMT; Outcome measures: VAS, NRS, NDI, SF-36, Nordic Questionnaire, NPPQ, and medication change; Outcome measurement interval: Baseline and 3 months.</p>	<p>The authors concluded that “based on the 3 included studies, the review suggested clinically relevant effects of OMT for reducing pain in patients with chronic nonspecific neck pain. Given the small sample sizes, different comparison groups, and lack of long-term measurements in the few available studies, larger, high-quality randomized controlled trials with robust comparison groups are recommended”.</p>
4	<p>Casanova-Méndez A, Oliva-Pascual-Vaca A, Rodriguez-Blanco C, Heredia-Rizo AM, Gogorza-Arroitaonandia K, Almazán-Campos G. Comparative short-term effects of two thoracic spinal manipulation techniques in subjects with chronic mechanical neck pain: a randomized controlled trial. <i>Man Ther.</i> 2014;19(4):331-7.</p>	<p>Study design: RCT; Study population: Patients with neck pain; Duration of symptoms: Chronic; Sample size: N=60; Intervention: Dog technique; Comparator: Toggle-recoil technique; Outcome measures: VAS, cervical RoM, and pain pressure threshold at C4 and T4;</p>	<p>The authors concluded that “Both manoeuvres improved neck mobility and mechano-sensitivity and reduced pain in the short term. No major or clinical differences were found between the groups. In the between-groups comparison slightly better results were observed in the Toggle-Recoil group only for cervical extension (p = 0.009),</p>

	doi: 10.1016/j.math.2014.03.002. http://www.ncbi.nlm.nih.gov/pubmed/24679838	Outcome measurement interval: Pre-intervention and 20 minutes post-intervention.	right lateral flexion ($p = 0.004$) and left rotation ($p < 0.05$).
5	Mandara A, Ceriani A, Guzzetti G, Gulisano V, Fusaro A, Bado F. Osteopathic manipulative treatment for chronic neck pain: a randomised controlled trial on the effect on pain and disability. International Journal of Osteopathic Medicine 2010;13:105	Study design: RCT; Study population: Patients with neck pain; Duration of symptoms: Chronic; Sample size: N=28; Intervention: OMT and standard care; Comparator/Control: Sham manipulation and standard care; Outcome measures: VAS and Neck Disability Index (Italian version); Outcome measurement interval: Baseline and 6 weeks.	The authors concluded that “OMT added to standard care was able to significantly reduce neck pain and disability compared to SMT. The effect of treatment seems to depend on the number of manipulative sessions”.
6	Schwerla F, Bischoff A, Nurnberger A, Genter P, Guillaume JP, Resch KL. Osteopathic treatment of patients with chronic non-specific neck pain: a randomised controlled trial of efficacy. Forsch Komplementmed 2008;15:138-45. http://www.ncbi.nlm.nih.gov/pubmed/18617745	Study design: RCT; Study population: Patients with non-specific neck pain; Duration of symptoms: Chronic (≥ 3 months) Sample size: N= 41; Intervention: OMT and sham ultrasound; Comparator/Control: Sham ultrasound; Outcome measures: NRS, Northwick Park	The authors concluded that “the results of this first rigorous randomised controlled trial seem to confirm previous empirical findings, and are in favour of an osteopathic treatment of chronic non-specific neck pain as a method with long term effects”.

		<p>Pain Questionnaire, SF-36, Nordic questionnaire, osteopathic examination form, and medication questionnaire and diary.</p> <p>Outcome measurement interval: Baseline and 3 months.</p>	
7	<p>Tempel R, Steffen S, Ruetz M, Schwerla F. Osteopathy as an effective treatment alternative to physical therapy for patients suffering chronic non-specific neck pain: a randomised controlled trial. Paper presented at Seventh International Conference on Advances in Osteopathic Research, 2008. Florida, USA.</p>	<p>Study design: RCT;</p> <p>Study population: Patients with non-specific neck pain;</p> <p>Duration of symptoms: Chronic (\geq 3months);</p> <p>Sample size: N=60;</p> <p>Intervention: OMT;</p> <p>Comparator/Control: Physiotherapy;</p> <p>Outcome measures: VAS, duration of pain, SF-36, frequency of pain, Nordic questionnaire;</p> <p>Outcome measurement interval: Baseline and 3 months.</p>	<p>The authors concluded that “Five osteopathic treatments over a 10-week period could cause a clinically relevant influence on pain and quality of life in patients with chronic neck disorders”.</p>
8	<p>Williams NH, Edwards RT, Linck P, Muntz R, Hibbs R, Wilkinson C, Russell I, Russell D, Hounsome B. Cost-utility analysis of osteopathy in primary care: results from a pragmatic randomized controlled trial. Fam Pract. 2004;21(6):643-50.</p>	<p>Study design: Cost utility analysis of RCT;</p> <p>Study population: Patients with spinal pain;</p> <p>Duration of symptoms: 2-12 weeks;</p> <p>Sample size: N=201;</p> <p>Intervention: Usual GP care + 3 or 4</p>	<p>The authors concluded that “a primary care osteopathy clinic may be a cost-effective addition to usual GP care, but this conclusion was subject to considerable random error. Rigorous multi-centre studies are needed to</p>

	http://www.ncbi.nlm.nih.gov/pubmed/15531626	<p>sessions of OMT;</p> <p>Comparator/Control: Usual GP care;</p> <p>Outcome measures: EASPS, SF-12, EQ5D. and SFMQ;</p> <p>Outcome measurement interval: 2 and 6 months.</p>	<p>assess the generalizability of this approach”.</p>
9	<p>Williams NH, Wilkinson C, Russell I, Edwards RT, Hibbs R, Linck P, Muntz R. Randomized osteopathic manipulation study (ROMANS): pragmatic trial for spinal pain in primary care. Fam Pract. 2003;20(6):662-9.</p> <p>http://www.ncbi.nlm.nih.gov/pubmed/14701889</p>	<p>Study design: RCT;</p> <p>Study population: Patients with spinal pain;</p> <p>Duration of symptoms: 2-12 weeks;</p> <p>Sample size: N=201;</p> <p>Intervention: Usual GP care + 3 or 4 sessions of OMT;</p> <p>Comparator/Control: Usual GP care;</p> <p>Outcome measures: EASPS, SF-12, EQ5D. and SFMQ;</p> <p>Outcome measurement interval: 2 and 6 months.</p>	<p>The authors concluded that “a primary care osteopathy clinic may be a cost-effective addition to usual GP care, but this conclusion was subject to considerable random error. Rigorous multi-centre studies are needed to assess the generalizability of this approach”.</p>
10	<p>Vincent K, Maigne JY, Fischhoff C, et al. Systematic review of manual therapies for non-specific neck pain. Joint Bone Spine. 2013;80(5):508-15.</p> <p>http://www.ncbi.nlm.nih.gov/pubmed/23165183</p>	<p>Study design: Systematic review;</p> <p>Study population: Patients with non-specific neck pain;</p> <p>Duration of symptoms: Acute and chronic;</p> <p>Sample size: N= 598 (Acute) and N= 1201 (Chronic);</p> <p>Intervention: Manual therapy;</p> <p>Comparator/Control: Various among</p>	<p>The authors concluded that “manual therapies contribute usefully to the management of nonspecific neck pain. The level of evidence is moderate for short-term effects of upper thoracic manipulation in acute neck pain, limited for long-term effects of neck manipulation, and limited for all techniques and follow-up durations in</p>

		<p>included studies;</p> <p>Outcome measures: Various among included studies;</p> <p>Outcome measurement interval: Various among included studies.</p>	chronic neck pain”.
11	<p>Furlan AD, Yazdi F, Tsertsvadze A, et al. A systematic review and meta-analysis of efficacy, cost-effectiveness, and safety of selected complementary and alternative medicine for neck and low back pain. Evidence-Based Complementary and Alternative Medicine. 2012; 2012:953139. http://www.ncbi.nlm.nih.gov/pubmed/2203884</p>	<p>Study design: Systematic review and meta-analysis;</p> <p>Study population: Patients with neck and low back pain;</p> <p>Duration of symptoms: Various among included studies;</p> <p>Sample size: N= 162 (low back pain patients) and N= 104 (neck pain patients);</p> <p>Intervention: Techniques used in CAM treatments;</p> <p>Comparator/Control: Various among included studies;</p> <p>Outcome measures: VAS, MPQ, RMDQ, NPQ, PDI, and ODI;</p> <p>Outcome measurement interval: immediate, short term (<3 months), intermediate (3-12 months) and long term (> 12 months).</p>	<p>The authors concluded that “CAM treatments were significantly more efficacious than no treatment, placebo, physical therapy, or usual care in reducing pain immediately or at short-term after treatment. CAM therapies did not significantly reduce disability compared to sham. None of the CAM treatments was shown systematically as superior to one another. More efforts are needed to improve the conduct and reporting of studies of CAM treatments”.</p>
12	Miller J, Gross A, D'Sylva J, et al. Manual	Study design: Systematic review;	The authors concluded “high quality

	<p>therapy and exercise for neck pain: a systematic review. <i>Man Therapy</i>. 2010;15(4):334-54. http://www.ncbi.nlm.nih.gov/pubmed/20593537</p>	<p>Study population: Patients with neck pain with or without radiculopathy or cervicogenic headache; Duration of symptoms: Acute or chronic; Sample size: N=1314; Intervention: Manual therapy and exercise; Comparator/Control: Various including placebo, waiting list, no treatment, adjunctive treatment, and ultrasound; Outcome measures: Various among included studies. Outcome measurement interval: Various among included studies.</p>	<p>evidence suggests greater short-term pain relief [pSMD-0.50(95% CI: -0.76, -0.24)] than exercise alone, but no long-term differences across multiple outcomes for (sub)acute/chronic neck pain with or without cervicogenic headache. Moderate quality evidence supports this treatment combination for pain reduction and improved quality of life over manual therapy alone for chronic neck pain; and suggests greater short-term pain reduction when compared to traditional care for acute whiplash. Evidence regarding radiculopathy was sparse. Specific research recommendations are made”.</p>
13	<p>D'Sylva J, Miller J, Gross A, Burnie SJ, Goldsmith CH, Graham N, Haines T, Brønfort G, Hoving JL; Cervical Overview Group. Manual therapy with or without physical medicine modalities for neck pain: a systematic review. <i>Man Therapy</i>. 2010 ;15(5):415-33. http://www.ncbi.nlm.nih.gov/pubmed/20538501</p>	<p>Study design: Systematic review; Study population: Patients with neck pain; Duration of symptoms: Acute and chronic; Sample size: A total of 19 trials were included in the analysis; Intervention: Manipulation, mobilisation, soft tissue techniques, manual therapy, and physical medicine. Comparator/Control: A range including</p>	<p>The authors concluded “moderate quality evidence (1 trial, 221 participants) suggested mobilisation, manipulation and soft tissue techniques decrease pain and improved satisfaction when compared to short wave diathermy, and that this treatment combination paired with advice and exercise produces greater improvements in GPE and satisfaction than advice and exercise alone for acute</p>

		<p>placebo, waiting list/no treatment, adjunctive treatment (e.g. ultrasound) or another treatment;</p> <p>Outcome measures: Various among included studies;</p> <p>Outcome measurement interval: Various among included studies.</p>	<p>neck pain. Low quality evidence suggests a clinically important benefit favouring mobilisation and manipulation in pain relief [1 meta-analysis, 112 participants: SMD -0.34(95% CI: -0.71, 0.03), improved function and GPE (1 trial, 94 participants) for participants with chronic cervicogenic headache when compared to a control at intermediate and long term follow-up; but no difference when used with various physical medicine modalities”.</p>
14	<p>Gross A, Miller J, D'Sylva J, Burnie SJ, Goldsmith CH, Graham N, Haines T, Brønfort G, Hoving JL. Manipulation or mobilisation for neck pain. Cochrane Database Syst Rev. 2010 Jan 20;(1):CD004249. doi: 10.1002/14651858.CD004249.pub3. http://www.ncbi.nlm.nih.gov/pubmed/20091561</p>	<p>Study design: Systematic review;</p> <p>Study population: Patients with neck pain;</p> <p>Duration of symptoms: Acute, subacute or chronic;</p> <p>Sample size: N=1522;</p> <p>Intervention: Cervical and thoracic manipulation, Maitland mobilisation, and neural dynamic mobilisation;</p> <p>Comparator/Control: Various among included studies;</p> <p>Outcome measures: Various among included studies;</p> <p>Outcome measurement interval: Various</p>	<p>The authors concluded “cervical manipulation and mobilisation produced similar changes. Either may provide immediate- or short-term change; no long-term data are available. Thoracic manipulation may improve pain and function. Optimal techniques and dose are unresolved. Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate”.</p>

		among included studies.	
15	<p>Hurwitz EL, Carragee EJ, van der Velde G, et al. Treatment of neck pain: non-invasive interventions. Results of the Bone and Joint Decade 2000–2010 Task Force on Neck Pain and Its Associated Disorders. Journal of Manipulative and Physiological Therapeutics. 2009;32(2 Suppl):S141-75.</p> <p>http://www.ncbi.nlm.nih.gov/pubmed/19251061</p>	<p>Study design: Best evidence synthesis; Study population: Patients with neck pain; Duration of symptoms: Acute and chronic; Sample size: A total of 156 articles were identified including 80 primary studies and 30 systematic reviews; Intervention: A range including mobilisation and exercise; Comparator/Control: Various among included studies; Outcome measures: Various among included studies; Outcome measurement interval: Various among included studies.</p>	<p>The authors concluded “Our best evidence synthesis suggests that therapies involving manual therapy and exercise are more effective than alternative strategies for patients with neck pain; this was also true of therapies which include educational interventions addressing self-efficacy. Future efforts should focus on the study of non-invasive interventions for patients with radicular symptoms and on the design and evaluation of neck pain prevention strategies”.</p>
16	<p>Posadzki P, Ernst E. Spinal manipulations for tension-type headaches: a systematic review of randomized controlled trials. Complement Therapies in Medicine. 2012;20(4):232-239</p> <p>http://www.ncbi.nlm.nih.gov/pubmed/22579436</p>	<p>Study design: Systematic review; Study population: Patients with tension-type headaches; Duration of symptoms: Various among included studies; Sample size: N=348; Intervention: Spinal manipulation; Comparator/Control: Various among</p>	<p>The authors concluded “the evidence that spinal manipulation alleviates tension type headaches is encouraging, but inconclusive. The low quantity of the available data prevent firm conclusion”.</p>

		<p>included studies; Outcome measures: Various among included studies; Outcome measurement interval: Various among included studies.</p>	
17	<p>Chaibi A, Russell MB. Manual therapies for cervicogenic headache: a systematic review. Journal of Headache Pain. 2012;13(5):351-359. http://www.ncbi.nlm.nih.gov/pubmed/2460941</p>	<p>Study design: Systematic review; Study population: Patients with cervicogenic headache; Duration of symptoms: From 5 weeks to 12 months; Sample size: N=492; Intervention: Manual therapy; Comparator/Control: Various among included studies; Outcome measures: Various among included studies; Outcome measurement interval: Various among included studies.</p>	<p>The authors concluded “the results are difficult to evaluate, since only one study included a control group that did not receive treatment. Furthermore, the RCTs mostly included participant with infrequent CEH. Future challenges regarding CEH are substantial both from a diagnostic and management point of view”.</p>
18	<p>Chaibi A, Tuchin PJ, Russell MB. Manual therapies for migraine: a systematic review. Journal of Headache Pain. 2011;12(2):127-133 http://www.ncbi.nlm.nih.gov/pubmed/1298314</p>	<p>Study design: Systematic review; Study population: Patients with migraine headache; Duration of symptoms: ^ months or more, or a minimum of 4 headache days per month; Sample size: N=706;</p>	<p>The authors concluded “The RCTs suggest that massage therapy, physiotherapy, relaxation and chiropractic spinal manipulative therapy might be equally effective as propranolol and topiramate in the prophylactic management of migraine.</p>

		<p>Intervention: Massage, physical or manipulative therapy;</p> <p>Comparator/Control: Various among included studies;</p> <p>Outcome measures: Various among included studies;</p> <p>Outcome measurement interval: Various among included studies.</p>	<p>However, the evaluated RCTs had many methodological shortcomings. Therefore, any firm conclusion will require future, well-conducted RCTs on manual therapies for migraine”.</p>
19	<p>Posadzki P, Ernst E. Spinal manipulations for cervicogenic headaches: a systematic review of randomized clinical trials. Headache. 2011;51(7):1132-9. http://www.ncbi.nlm.nih.gov/pubmed/21649656</p>	<p>Study design: Systematic review;</p> <p>Study population: Adult and child patients with cervicogenic headaches of varying aetiology;</p> <p>Duration of symptoms: Acute and subacute;</p> <p>Sample size: N=607;</p> <p>Interventions: Spinal manipulation, sham manipulation, light massage, drugs, and physical therapy;</p> <p>Comparator/Control: Various among included studies;</p> <p>Outcome measures: Various among included studies;</p> <p>Outcome measurement interval: Various among included studies.</p>	<p>The authors concluded “Six RCTs suggested that spinal manipulation is more effective than physical therapy, gentle massage, drug therapy, or no intervention. Three RCTs showed no differences in pain, duration, and frequency of headaches compared to placebo, manipulation, physical therapy, massage, or wait list controls. Adequate control for placebo effect was achieved in 1 RCT only, and this trial showed no benefit of spinal manipulations beyond a placebo effect. The majority of RCTs failed to provide details of adverse effects. There are few rigorous RCTs testing the effectiveness of spinal manipulations for treating cervicogenic headaches. The results are mixed and</p>

			the only trial accounting for placebo effects fails to be positive. Therefore, the therapeutic value of this approach remains uncertain.
20	<p>Bronfort G, Nilsson N, Haas M, et al. Non-invasive physical treatments for chronic/recurrent headache. Cochrane Database of Systematic Reviews. 2004;(3):CD001878. http://www.ncbi.nlm.nih.gov/pubmed/15266458</p>	<p>Study design: Systematic review; Study population: Patients with chronic/recurrent headache; Duration of symptoms: Chronic; Sample size: N=2628; Intervention: A range were considered including spinal manipulation, stretching, massage, therapeutic touch, cranial electrotherapy, amitriptyline, and TENS; Comparator/Control: Various among included studies; Outcome measures: Various among included studies; Outcome measurement interval: Various among included studies.</p>	<p>The authors concluded “A few non-invasive physical treatments may be effective as prophylactic treatments for chronic/recurrent headaches. Based on trial results, these treatments appear to be associated with little risk of serious adverse effects. The clinical effectiveness and cost-effectiveness of non-invasive physical treatments require further research using scientifically rigorous methods. The heterogeneity of the studies included in this review means that the results of a few additional high-quality trials in the future could easily change the conclusions of our review”.</p>
21	<p>Bronfort G, Assendelft WJ, Evans R, et al. Efficacy of spinal manipulation for chronic headache: a systematic review. Journal of Manipulative and Physiological Therapeutics. 2001;24(7):457-66. http://www.ncbi.nlm.nih.gov/pubmed/1</p>	<p>Study design: Systematic review; Study population: Patients with chronic headache; Duration of symptoms: Chronic; Sample size: N=683; Intervention: Spinal manipulation; Comparator/Control: A range were used</p>	<p>The authors concluded “SMT appears to have a better effect than massage for cervicogenic headache. It also appears that SMT has an effect comparable to commonly used first-line prophylactic prescription medications for tension-type headache and migraine headache.</p>

	1562654	including amitriptyline, deep friction with placebo, mobilization, palpation and rest, cold packs, azapropazone, and waiting list Outcome measures: Various among included studies; Outcome measurement interval: Various among included studies.	This conclusion rests upon a few trials of adequate methodological quality. Before any firm conclusions can be drawn, further testing should be done in rigorously designed, executed, and analyzed trials with follow-up periods of sufficient length.”
22	Hoyt WHSF. Osteopathic manipulation in the treatment of muscle contraction headache. J Am Osteopath Assoc, 1979;78: 322-325	Study design: RCT; Study population: Patients with muscle contraction headache; Duration of symptoms: Chronic; Sample size: N=22; Intervention: OMT; Comparator/Control: Palpatory examination, and no intervention; Outcome measures: Headaches severity and EMG levels in frontalis muscle Outcome measurement interval: Not disclosed.	The authors concluded that “there was a statistically significant difference in subjective ratings of pain relief between groups of patients treated by palpatory examination and osteopathic manipulation and by other measures. Data from this study and those reported elsewhere suggest that the central mechanism in muscle-contraction headache may involve modulation of autonomic reactivity by a cortical-limbic process”.

Abbreviations:

CAM: Complementary and Alternative Medicine

CEH: Cervicogenic headache

EASPS: Extended Aberdeen Spinal Pain Score

EQ5D: Euroqol 5D

FABQ: Fear Avoidance Beliefs Questionnaire

MPQ: McGill Pain Questionnaire

NPPQ: Northwick Park Pain Questionnaire

NRS: Numerical Rating Scale

N/S: Non-specific

OMT: Osteopathic Manipulative Therapy

ODI: Oswestry Disability Index

PDI: Pain Disability Index

PRS: Pain Rating Scale

QBPDS: Quebec Back Pain Disability Scale

RCT: Randomised Controlled Trial

RMDQ: Roland Morris Disability Questionnaire

RoM: Range of Motion

SE: Specific exercise

SF36: Short Form-36

SFMQ: Short Form McGill Pain Questionnaire

SMT: Spinal Manipulative Therapy

TENS: Transcutaneous Electrical Nerve Stimulation

VAS: Visual Analogue Scale