

Headache in Children: Update on Complementary Treatments

Stefanie Schetzek¹ Florian Heinen¹ Sigrid Kruse¹ Ingo Borggraefe¹ Michaela Bonfert¹ Charly Gaul²
Sven Gottschling³ Friedrich Ebinger^{4,5}

¹ Department of Paediatric Neurology and Developmental Medicine, Hauner Children's Hospital, University of Munich, Munich, Germany

² Department of Neurology, University of Essen, Essen, Germany

³ Centre for Palliative Care for Children, University Children's Hospital, Homburg, Germany

⁴ Children's Hospital, Paderborn, Germany

⁵ Center for Pediatrics, Department of Neuropediatrics, Ruprecht-Karls-University of Heidelberg, Baden-Württemberg, Germany

Address for correspondence and reprint requests Stefanie Schetzek, MD, Department of Paediatric Neurology and Developmental Medicine, Hauner Children's Hospital, University of Munich, Lindwurmstrasse 4, 80337 Munich, Germany (e-mail: stefanie.schetzek@med.uni-muenchen.de).

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Abstract

Keywords

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- ▶ headache
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Complementary and alternative medicine (CAM) is widely used by both physicians and patients with primary headache syndromes. Despite a considerable number of articles addressing CAM in primary headache syndromes, the overall evidence for CAM is still poor. The aim of this review was to give an overview of the current evidence of the main alternative therapies used in the treatment of primary headache syndromes of childhood. MEDLINE and Cochrane Library were systematically searched for articles dealing with complementary and alternative treatment or prophylaxis of headache and migraine published within the past 20 years.

Introduction

Complementary and alternative medicine (CAM) is increasingly popular in the treatment of headache in children. Several studies, performed in various countries, have shown a prevalence of the use of CAM among children with acute conditions of 12 to 23%^{1,2} and for children with chronic illnesses, 44 to 54%.³ Two German studies showed some use of CAM in 81.7% of the patients attending tertiary outpatient clinics⁴ and that 75.7% of the 115 observed children in a pediatric day center received CAM from their parents.⁵ Most children in the day center (58.4%) received a combination of CAM and so-called conventional medicine, whereas 15.6% used CAM alone and 26.0% used only conventional prescribed medications. The physician was informed about the CAM treatment only in half of the cases.⁵ Despite the growing number of publications on CAM, there is no generally accepted definition of CAM.⁶ The U.S. National Center for Complementary and Alternative Medicine defines CAM as “a

group of diverse medical and health care systems, practices, and products that are not currently considered to be part of conventional medicine.”⁷

The overall use of CAM therapies increased in the US population from 33.8 to 42.1% in the interval of 1990 to 1997 and in Germany from 52% in 1970 to 65% in 1997.^{8,9} In general, pharmacologic prophylaxis of chronic headache in children is only indicated, if lifestyle modification and non-pharmacologic prophylaxis are not effective.¹⁰ The use of CAM is predominantly motivated by the wishes “to leave nothing undone,” “to be active against the disease,” and to avoid side effects.⁴ In both children and adults, the use of CAM in primary headache syndromes increases with a higher number of headache days, longer duration of headache treatment, higher personal costs, and use of CAM for other diseases.⁴ Studies addressing more established therapies than CAM in children deal with pharmacologic approaches to terminate acute headaches attacks and the prevention of

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attacks.¹⁰ This review gives an overview of the current evidence of the main alternative therapies used in the treatment of primary headache in children.

Methods

MEDLINE and Cochrane Library were systematically searched for articles dealing with complementary and alternative treatment or prophylaxis of headache/migraine published from September 1992 through September 2012. To maximize the number of eligible articles, studies reporting on adults were included, due to the small number of headache-specific pediatric trials in complementary medicine. We refer to the existing pediatric articles in the particular sections.

The following search commands were applied: "CAM-method" AND headache *or* migraine; Complementary medicine AND headache *or* migraine. The language filter was set to English and German publications. The identified titles and abstracts were reviewed for content and relevance to select those covering CAM aspects of pediatric headache.

In addition, checking the reference lists of the selected articles for pertinent articles and searching as well the CAM-QUEST database, a European-wide search portal for CAM, completed the bibliography.

Acupuncture

Acupuncture is a fundamental component of traditional Chinese medicine, a technique used for about 3,000 years.¹¹ Today, this technique is one of the most commonly used complementary therapies in many countries.¹²

Within the concept of traditional Chinese medicine, migraine is considered to be an internal disease, mostly interpreted as a disorder of the liver. According to traditional Chinese medicine, the goal of acupuncture is to restore a state of equilibrium by removing blockages in the flow of blood and *qi*. The mechanisms by which acupuncture should obtain an analgesic effect in headache treatment are not completely understood. However, some reports on experimental measurable and repeatable physiologic effects exist, and several hypotheses like an activation of nervous system structures in the control of pain perception¹³⁻¹⁵ and probable anti-inflammatory effects¹⁶⁻¹⁸ of acupuncture have been shown in experimental studies.

The available articles referring to acupuncture and headache treatment are very heterogeneous. Several randomized controlled trials (RCTs) have been performed that examined the effect of acupuncture in chronic headache prophylaxis, using different acupuncture points and needles, electroacupuncture or laser acupuncture, and comparing with sham acupuncture (non-acupoints), to minimal acupuncture (needles inserted into non-acupoints and/or superficially) or a standard medicational therapy. Some studies sought to evaluate the use of acupuncture in acute migraine treatment.

Literature on acupuncture in children with headaches is still poor. One study¹⁹ examining 22 migraine patients aged 7 to 15 years and divided into two groups ("true" and "placebo" acupuncture) found a significant reduction in the frequency and intensity of the migraine attacks in the group with true

acupuncture. Furthermore, they found a significant increase in β -endorphin levels in the plasma in the acupuncture group versus the placebo group. Another RCT study examining laser acupuncture in 43 children (mean age \pm SD, 12.3 \pm 2.6 years) with headache²⁰ showed a significant decrease of the mean number of headaches per month and significantly decreased headache severity and monthly hours with headache in the treatment group.

A Cochrane review was split into separate reviews on migraine²¹ and tension-type headache.²² The migraine review included 22 trials with 4,419 participants. In five of the six trials that compared acupuncture with no prophylactic treatment or routine care only, the patients receiving acupuncture had higher response rates and fewer headaches after 3 to 4 months. Four trials compared acupuncture to proven prophylactic drug treatment. Overall, in these trials acupuncture was associated with slightly better outcomes and fewer adverse effects than prophylactic drug treatment (but not to sham intervention) regarding responder rate and attack frequency, although the small effect size might question the clinical relevance.

Whereas in this review true acupuncture intervention compared with sham interventions in 14 trials did not show a statistically significant superiority, a more recent meta-analysis²³ on acupuncture for chronic pain did not only find acupuncture effective for the treatment of chronic pain but significant differences between true and sham acupuncture as well, which would indicate that acupuncture is more than a placebo.

The review on acupuncture in the treatment of tension-type headache included 11 trials with 2,317 participants. Five of the six trials comparing acupuncture with a sham acupuncture intervention showed small but statistically significant benefits of acupuncture over sham. Three of the four trials comparing acupuncture with physiotherapy, massage, or relaxation techniques were difficult to interpret but on the whole suggested slightly better results for some outcomes in the control groups.²² The improvements were observed in all specified outcome measures as proportion of responders, number of headache days, headache intensity, frequency of use of analgesic agents, and headache scores. However, the clinical relevance of the improvements could not be concluded due to the small effect size.

The data on acupuncture in terminating a migraine attack are not easy to interpret. In one study²⁴ acupuncture showed an effect superior to placebo in preventing a full attack, but sumatriptan provided a faster response and was more effective when used as a second intervention in patients who developed a full attack. In practicality, acupuncture on an emergency basis might not always be readily available. The studies addressing acupuncture in primary headache syndromes are summarized in **Table 1**.

To summarize, acupuncture might provide a valuable nonpharmacologic tool within the multidisciplinary treatment of chronic headaches. However, acupuncture should only be practiced on patients who are old enough to cooperate, and further studies are needed to consolidate the promising suggestions for children under rigorous standards. These

Table 1 Acupuncture

Study by reference no.	Population	Intervention	Study design	Level of evidence	Result
19	Children	Acupuncture in migraine	OT	C	Migraine frequency and intensity were decreased significantly after true acupuncture, whereas no significant improvements were seen after placebo acupuncture (though a <i>p</i> value was not reported).
20	Children	Laser acupuncture in migraine and tension-type headache	RCT	B	Reduction of the mean number of headaches per month (<i>p</i> < 0.001), severity, and monthly hours when compared with sham intervention.
21	Mainly adults	Acupuncture in migraine	MA	A	Benefit of treatment of acute migraine attacks compared with routine care, no evidence for an effect of acupuncture over sham intervention.
22	Mainly adults	Acupuncture in tension-type headache	MA	A	Benefit of treatment compared with routine care, sham intervention, and other therapies.
23	All ages	Acupuncture in chronic pain	MA	A	Benefit of treatment compared with sham intervention.
24	Adults	Sumatriptan or acupuncture in preventing of acute migraine attacks versus placebo	RCT	B	Sumatriptan (<i>p</i> < 0.001) and acupuncture (<i>p</i> = 0.02) were effective compared with placebo in preventing an acute migraine attack, whereas sumatriptan was shown to act faster.

Note: Level A: two or more clinically controlled, randomized studies performed according to good clinical practice (GCP), versus placebo or versus active treatment of proven efficacy. Level B: one clinically controlled, randomized study performed according to GCP or more than one well-designed clinical case-control study or cohort study. Level C: favorable judgment of two thirds of the Ad Hoc Committee members, historical control subjects, nonrandomized studies, case reports.

Abbreviations: MA, meta-analysis; OT, open trial; RCT, randomized controlled trial.

standards could implicate carefully selected control interventions as sham acupuncture and/or established pharmacologic therapies with a sufficient sample size to show at least noninferiority.

Homeopathy

Homeopathy is a 250-year-old health care system, founded by Samuel Hahnemann, MD. It is one of the most frequently used²⁵ and widespread alternative therapies, especially common in Germany, France, the United Kingdom, North America, and India. Within the context of homeopathy, the proclaimed basis is the so-called principle of similarity, according to which a substance that causes the symptoms of a disease in healthy people will cure that disease in sick people.²⁶ A further attribute is the use of minute doses, that is, logarithmic potencies with “dilutions” beyond any likelihood to contain even one molecule of the original substance over the 12C potency (corresponding to a dilution of 10⁻²⁴). Interestingly, reports demonstrate that it is possible to determine the original substance in “ultra-high dilutions”²⁷ far beyond the 12C with special methods. The active principle of homeopathy is still not understood.

Recently, the first pediatric study on homeopathic treatment of headaches (migraines) has been published. This

observational, prospective, noncomparative, multicenter study showed a significant decrease in the frequency, severity, and duration of migraine attacks and reduced absenteeism from school during 6 months of treatment.²⁸ Within the last 20 years two observational headache studies have been published with adults patients^{29,30} and four RCT headache studies with adults patients.³¹⁻³⁴ The observational studies showed significant improvements of the homeopathically treated patients, the second one likewise a marked decrease of the use of conventional treatment and health services. Three of the four RCTs showed no significant benefit over placebo for homeopathic treatment,^{31,32,34} whereas one showed statistically significant reduction in attack frequency in the homeopathy group and statistically not significant trends in favor of homeopathy for pain intensity and overall evaluation.³³

The positive observational studies do not answer the question as to whether the positive effects of the homeopathic therapy are treatment specific or not. Although some homeopathic RCTs on other pediatric diseases, such as attention deficit hyperactivity disorder³⁵ and childhood diarrhea,³⁶ demonstrated treatment-specific effects of homeopathy, evidence-based proof of the effectiveness of homeopathic treatment has not been found. Furthermore,

RCT studies are required to verify possible benefits of homeopathic treatment in childhood headache and to determine the role of homeopathy in the multidisciplinary pediatric headache treatment. The studies addressing homeopathy in primary headache syndromes are summarized in **Table 2**.

Nutritional Supplements

Magnesium seems to play an important role in migraine pathogenesis. Deficiency in magnesium has been associated with cortical spreading depression,³⁷ platelet aggregation,³⁸ vasoconstriction,³⁹ and neurotransmitter release.⁴⁰

The data on magnesium in the prophylactic treatment for children are rare. One RCT⁴¹ was conducted to examine the prophylactic effect of oral magnesium oxide on migrainous headache in children and adolescents. This study did not unequivocally determine whether oral magnesium oxide is or is not overall superior to placebo in preventing frequent migrainous headache in children even if it showed a significant reduction in headache days.

Magnesium deficiency has been shown to be common in women with menstrual-related migraine,⁴² and magnesium supplementation from ovulation to the first day of flow has resulted in a significant reduction of the number of days with headache and of pain intensity compared with placebo.⁴³

Also, in gender-mixed RCTs magnesium (di-)citrate supplementation showed a significant prophylactic effect in patients with migraine without aura. Active treatment resulted in a significant decrease in attack frequency and severity.^{44,45}

The most common adverse effect associated with oral magnesium supplementation is diarrhea. Diarrhea seems to increase in the use of poorly absorbed magnesium salts as seen in a further RCT where almost half of the patients in the treatment group developed diarrhea and no effect on the migraine was seen.⁴⁶

Special caution is necessary in patients with kidney disease, due to the renal excretion of magnesium and an increased risk of magnesium toxicity (loss of deep tendon reflexes followed by muscle weakness, respiratory paralysis, and death) in patients with renal function impairment. Intravenous magnesium supplementation (1 g) has not been shown to be more effective than placebo in aborting migraine attacks.⁴⁷

Other migraine-influencing supplements are vitamin B2 (riboflavin) and coenzyme Q10, which play a role in mitochondrial function, which has been speculated to have a part in migraine pathology.^{48,49} Riboflavin was shown to lead possibly to a significant reduction of migraine attacks in adults,⁵⁰ whereas RCTs in children have not confirmed this

Table 2 Homeopathy

Study by reference no.	Population	Intervention	Study design	Level of evidence	Result
28	Children	Individualized homeopathic prescriptions in migraine	OT	C	Decrease of frequency, severity, and duration of migraine attacks (all $p < 0.001$), children spent less time off school ($p < 0.001$).
29	Adults	Individualized homeopathic prescriptions in migraine and tension-type headache	OT	C	Improvement in pain and the limitations caused by pain in $> 60\%$ of patients, all the differences between pre- and posttreatment were statistically significant, with the strongest results in the "bodily pain" and "vitality" parameters ($p < 0.0001$).
30	Adults	Individualized homeopathic prescriptions in migraine	OT	C	Reduction of migraine severity, improvement of quality of life, decrease of use of conventional treatment and health services ($p < 0.001$).
31	Adults	Individualized homeopathic prescriptions in migraine and tension-type headache	RCT	B	No significant difference in any parameter between homeopathy and placebo (frequency, use of medication for acute headache).
32	Adults	Individualized homeopathic prescriptions in migraine	RCT	B	No significant benefit over placebo of homeopathic treatment in attack frequency.
33	Adults	Homeopathic prescriptions individualized for each patient in migraine	RCT	B	No significant benefit with respect to frequency (diary), pain intensity, and drug consumption of homeopathic compared with placebo, but statistically significant reduction in attack frequency (neurologists' trial evaluation) in the homeopathy group ($p = 0.04$).

Note: Level B: one clinically controlled, randomized study performed according to good clinical practice or more than one well-designed clinical case-control study or cohort study. Level C: favorable judgment of two thirds of the Ad Hoc Committee members, historical control subjects, nonrandomized studies, case reports.

Abbreviations: OT, open trial; RCT, randomized controlled trial.

finding.^{51,52} However, there is some evidence for a reduction of mean frequency of headaches with a tension-type phenotype in favor of the riboflavin treatment.⁵² Few pediatric patients had vomiting or increased appetite, respectively, most likely for causes unrelated to the use of riboflavin.⁵³

There seemed to be evidence for a special effectiveness of coenzyme Q10 in the prophylaxis of pediatric migraine as a study⁵⁴ of 1,550 pediatric patients with frequent headaches measured coenzyme Q10 levels below the reference range in nearly one third of the subjects and found a significant reduction of headache frequency with rising coenzyme Q10 levels under coenzyme Q10 supplementation. In contrast to these findings, a more recent RCT⁵⁵ showed no difference in headache outcomes between coenzyme Q10 supplementation and placebo groups at the end of the observation period (32 weeks), only a significant improvement in weeks 1 to 4, which might suggest an earlier improvement in headache severity under coenzyme Q10 supplementation.

These dietary supplements are suitable for less severe migraines, as when beginning prophylactic therapy to avoid side effects of more evident medication or as one component of a multidisciplinary individual treatment. Preparations combining magnesium, vitamin B2, and coenzyme Q10 are available but expensive, and their efficacy not well proven. The decision whether to use these preparations or cheaper magnesium preparations alone must be made individually. The studies addressing nutritional supplements in primary headache syndromes are summarized in ►Table 3.

Herbal Preparations

Butterbur (*Petasites hybridus*) is a perennial shrub found throughout Europe and parts of Asia. It has been used traditionally as a remedy for pain, fever, spasms, and wound healing. The mode of action of this plant is not fully understood yet, but it is supposed to act through calcium channel regulation and inhibition of peptide leukotriene biosynthesis, thus influencing the inflammatory cascade associated with migraine.⁵⁶ The efficacy of *P. hybridus* in migraine prevention has been evaluated in numerous adult studies. In two studies in children (one an RCT), it was shown to be well tolerated and superior to placebo effect.^{57,58}

The butterbur plant is known to contain as well hepatotoxic and carcinogenic pyrrolizidine alkaloids. These substances are removed in commercially available preparations. Patients should be advised to use only certified and pyrrolizidine alkaloid-free products. The most frequently reported adverse events were mild gastrointestinal symptoms like eructation. For safety reasons a check of the aminotransferases after the first month of intake is recommended. In clinical practice the available products in Europe are considered safe, and increase of liver enzyme is rare.

Feverfew (*Tanacetum parthenium*) is a perennial herb that grows into a small bush originally native to the Balkan Mountains but now growing throughout Europe, North America, and South America. Traditionally, it is used in the treatment of fevers, headache, infertility, toothaches, inflammation, and arthritis. Its antimigraine action is credited to the partenolides within the leaves. It may act in migraine pro-

phylaxis by inhibiting platelet aggregation and the release of serotonin from platelets and white blood cells. It may also act as an anti-inflammatory agent through the inhibition of prostaglandin synthesis and phospholipase A.^{59–62} The contradictory results of many RCTs for the efficacy of feverfew in migraine were attributed to wide variations in the strength of the partenolides⁶³ and differences in the stability of feverfew preparations.⁶⁴ Subsequently, a more stable feverfew extract (MIG-99) was created. A double-blind, placebo-controlled study that used the standardized extract in 170 patients showed a significant improvement under therapy with 6.25 mg feverfew CO₂ extract (MIG-99) three times a day in adults.⁶⁵ Examinations in pediatric patients are still to be done. No major safety or tolerability issues have been reported, although side effects in the RCTs included gastrointestinal disturbances, mouth ulcers, and a “post-feverfew syndrome” of joint aches. Pregnant women should not use feverfew because it may cause uterine contractions, resulting in miscarriage or preterm labor. It can also cause allergic reactions. Patients with allergies to other members of the daisy family, including ragweed and chrysanthemums, are more likely to be allergic to feverfew. Studies addressing herbal preparations in primary headache syndromes are summarized in ►Table 4.

Manual Therapies and Osteopathy/Osteopathic Medicine

The definitions of osteopathic medicine are quite varied.⁶⁶ Thus, the few articles dealing with this matter are not easy to compare. The only RCT on manual therapy in children and adolescents with suspected cervicogenic headache failed to show efficacy.⁶⁷ Studies on osteopathic treatment in pediatric patients with primary headache syndromes are still missing.

A systematic review of RCTs of CAM in the treatment of tension-type and cervicogenic headache from 1999⁶⁸ indicated from a subset of high-quality studies that some CAM therapies may be useful in the treatment of these common forms of headache. One of the adult studies,⁶⁹ a prospective, randomized, parallel-group comparison of amitriptyline, spinal manipulation, and their combination, failed to show an advantage of combining amitriptyline and spinal manipulation for the treatment of migraine headache. However, clinically important improvement was observed in all three study groups over time. The reduction of headache intensity reached 49% for amitriptyline, 40% for spinal manipulation, and 41% for their combination. During the posttreatment follow-up period, the reduction from baseline was reported to be 24% for amitriptyline, 42% for spinal manipulation, and 25% for their combination ($p = 0.05$). Overall, spinal manipulation seemed to be as effective in this study as a well-established and efficacious pharmacologic treatment. The studies addressing manual therapies in primary headache syndromes are summarized in ►Table 5.

Discussion

Biobehavioral therapy, covering relaxation techniques, biofeedback treatment, operant pain treatment, pain coping,

Table 3 Nutritional supplements

Study by reference no.	Population	Intervention	Study design	Level of evidence	Result
41	Children	Magnesium versus placebo in migraine	RCT	B	Decrease over time in headache frequency in the magnesium oxide group ($p = 0.0037$) but not in the placebo group ($p = 0.086$), although the slopes of these two lines were not statistically significantly different from each other ($p = 0.88$); the group treated with magnesium oxide had significantly lower headache severity ($p = 0.0029$) relative to the placebo group.
44	Adults	Magnesium versus placebo in migraine	RCT	B	Reduction of attack frequency and drug consumption for symptomatic treatment per patient significantly higher in patients treated with magnesium ($p < 0.05$).
45	Adults	Magnesium versus placebo in migraine	RCT	B	Reduction of attack frequency ($p = 0.005$), attack severity ($p < 0.001$), and P1 amplitude ($p < 0.05$) in favor magnesium treatment versus placebo.
46	Adults	Magnesium versus placebo in migraine	RCT	B	No statistically significant differences in reduction of attack frequency and severity between magnesium and placebo.
47	Adults	Intravenous magnesium versus metoclopramide or placebo in acute migraine attacks	RCT	B	No significant differences of attack termination of magnesium compared with placebo.
51	Children	High-dose riboflavin versus placebo in migraine prophylaxis	RCT	B	Riboflavin was not superior to placebo in reducing attack frequency.
52	Children	Medium-dose riboflavin versus placebo in migraine prophylaxis	RCT	B	Riboflavin was not superior to placebo in reducing migraine attack frequency but in reducing attack frequency of headaches with a tension-type phenotype ($p = 0.04$).
53	Children	Riboflavin in migraine prophylaxis	OT	C	Attack frequency reduced significantly ($p < 0.01$).
50	Adults	High-dose riboflavin versus placebo in migraine prophylaxis	RCT	B	Riboflavin was superior to placebo in reducing attack frequency ($p = 0.005$) and headache days ($p = 0.012$).
54	Children	Coenzyme Q10 in migraine prophylaxis	OT	C	Improvement of headache frequency ($p < 0.001$) and headache disability assessed with PedMIDAS ($p < 0.001$).
55	Children	Coenzyme Q10 compared with placebo in migraine prophylaxis	RCT	B	Coenzyme Q10 was not superior to placebo in reducing migraine attack frequency, severity, and duration.

Note: Level B: one clinically controlled, randomized study performed according to good clinical practice or more than one well-designed clinical case-control study or cohort study. Level C: favorable judgment of two thirds of the Ad Hoc Committee members, historical control subjects, non-randomized studies, case reports.

Abbreviations: PedMIDAS, Pediatric Migraine Disability Assessment Score; OT, open trial; RCT, randomized controlled trial.

cognitive-behavioral, and multimodal treatment, is the approach of first choice in the prophylactic treatment of primary pediatric headache disorders. Nevertheless, CAM therapies play an increasing role in the multidisciplinary treatment of headaches in childhood and adolescence. Every headache patient needs to have a personalized and tailored program of education, psychological strategies, pharmacotherapy, and, as one further option, complementary medicine. The question of the most appropriate individualized therapy needs to be answered

undogmatically and without deciding strictly between conventional or complementary medicine. CAM may have promising perspectives especially in headache prevention, whereas in acute attacks, demanding a rapid and secure therapeutic approach, conventional medicinal options are still favored.

In assessing the possible benefit of CAM methods, we have to keep in mind their wide heterogeneity. In homeopathy and osteopathic medicine, only a few trials on pediatric headache therapy have been performed. Thus, even if these methods

Table 4 Herbal preparations

Study by reference no.	Population	Intervention	Study design	Level of evidence	Result
57	Children	Butterbur root extract in migraine compared with placebo	RCT	B	Butterbur was superior to placebo in reducing attack frequency during the follow-up period but not during the study period ($p = 0.044$).
58	Children	Butterbur root extract in migraine	OT	C	Seventy-seven percent of all patients reported a reduction in attack frequency of migraine attacks of at least 50%.
65	Adults	Feverfew CO ₂ extract (MIG-99) in migraine compared with placebo	RCT	B	MIG-99 was superior to placebo in reducing attack frequency ($p = 0.0049$).

Note: Level B: one clinically controlled, randomized study performed according to good clinical practice or more than one well-designed clinical case-control study or cohort study. Level C: favorable judgment of two thirds of the Ad Hoc Committee members, historical control subjects, nonrandomized studies, case reports.

Abbreviations: OT, open trial; RCT, randomized controlled trial.

Table 5 Manual therapies and osteopathy and osteopathic medicine

Study by reference no.	Population	Intervention	Study design	Level of evidence	Result
67	Children	Manual therapy in children and adolescents with cervicogenic headache compared with placebo	RCT	B	Manual therapy was not superior compared with placebo with respect to percentage of days with headache, total duration of headache, days with school absence due to headache, consume of analgesics, and intensity of headache.
68	Adults	Spinal manipulation, amitriptyline, and the combination of both therapies in migraine	OT	C	Reduction in headache index scores during treatment compared with baseline was 49% for amitriptyline, 40% for spinal manipulation, and 41% for the combined group, revealing the statistical differences between the treatment groups.
69	Adults	Systematic review of randomized clinical trials of CAM in the treatment of tension-type and cervicogenic headache	SR	B	Evidence from a subset of high-quality studies indicates that some CAM therapies may be useful in the treatment of these common forms of headache.

Note: Level B: one clinically controlled, randomized study performed according to good clinical practice or more than one well-designed clinical case-control study or cohort study. Level C: favorable judgment of two thirds of the Ad Hoc Committee members, historical control subjects, nonrandomized studies, case reports.

Abbreviations: OT, open trial; RCT, randomized controlled trial; SR, systematic review.

turned out to be a valid option, it remains questionable which variation of the method would be the most effective. In contrast for acupuncture, more evidence demonstrating its considerable role in headache prophylaxis is available. Research on acupuncture may soon reveal which treatment model proves to be the best within the method.

Further research is necessary using more rigorous and systematic methodology. Studies addressing established pharmacologic therapies of headaches in children are more prevalent than studies using CAM, suggesting a higher level of evidence. However, comparison of both methods is difficult because studies matching established pharmacologic treatments versus CAM within two therapy groups are lacking.¹⁰ The limited evidence of CAM therapy in pediatric headache is also in part caused by methodologic problems. Placebo effects

in children are much more powerful than in adults; therefore, it is difficult to show superiority of outcomes within treatment groups compared with control groups because both are treatment. In addition, beliefs, concepts, wishes, and concerns of patients and their parents show important influence on treatment acceptance.

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