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Integrative Medicine in Plastic Surgery:

A Systematic Review of Our Literature

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Abstract

Background: Surveys have reported that as high as 80% of plastic surgery patients utilize integrative medicine approaches including natural products (NPs) and mind-body practices (MBPs). Little is known regarding the evidence of benefit of these integrative therapies specifically in a plastic surgery patient population.

Methods: We conducted a systematic review of studies in MEDLINE, PubMed, and EMBASE (inception through December 2016) evaluating integrative medicine among plastic surgery patients. Search terms included 76 separate NP and MBP interventions as listed in the 2013 American Board of Integrative Health Medicine Curriculum. Two independent reviewers extracted data from each study, including study type, population, intervention, outcomes, conclusions (beneficial, harmful, or neutral), year of publication, and journal type. Level of evidence was assessed according to the American Society of Plastic Surgeons Rating Levels of Evidence and Grading Recommendations.

Results: Of 29 studies analyzed, 13 studies (45%) evaluated NPs and 16 (55%) studied MBPs. Level II reproducible evidence supports use of arnica to decrease postoperative edema after rhinoplasty, onion extract to improve scar pigmentation, hypnosis to alleviate perioperative anxiety, and acupuncture to improve perioperative nausea. Level I evidence reports on the risk of bleeding in ginkgo and kelp use and the risk of infection in acupuncture use. After year 2000, 92% of NP studies versus 44% of MBP studies were published ($P = 0.008$).

Conclusions: High-level evidence studies demonstrate promising results for the use of both NPs and MBPs in the care of plastic surgery patients. Further study in this field is warranted.

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Keywords

integrative medicine; mind-body practices; natural products; plastic surgery; systematic review

Integrative medicine (IM), defined as an integration of conventional practices with complementary health interventions not generally provided in mainstream US hospitals or taught in medical schools to treat the whole person,¹ has been gaining popularity and prevalence in recent years. In 1997, 42% of the general public in the United States used complementary therapies.² The National Center for Complementary and Integrative Health subdivides integrative therapies into 2 main categories: natural products (NPs) and mind-body practices (MBPs). A third subset may include traditional healing approaches that commonly include both NPs and MBPs. Complementary and IM approaches have been widely adopted by the general public.^{3–5}

Integrative medicine is utilized in a number of medical and surgical disciplines. Although its relevance to the field of plastic surgery may not be readily obvious, we propose it may be especially relevant in plastic surgery because of a number of factors. First, patients who undergo plastic surgery procedures, unlike other patients with chronic illness, often have complex psychosocial issues that compound physical health. Studies in plastic surgery populations have reported a high incidence of patients with psychological issues,^{6,7} which may be particularly amenable to a holistic, mind-body approach. The permanent changes to the body after a plastic surgery procedure also stress the importance of patient mental wellness and mind-body balance when adjusting to the visual physical alterations. In addition, there is the potential factor that an elective surgery population, as in the case of plastic surgery, may be more predisposed to seek out other treatments, such as NPs or MBPs, following surgery to improve outcomes. A recent study from the University of Florida utilizing a convenience sample demonstrated that 80% of patients presenting for elective plastic surgery had utilized IM within 1 year of presentation. The authors found that rates of IM utilization were high regardless of reason for visit (cosmetic vs reconstruction) or practice setting (private, academic, Veteran's Affairs). Of note, an almost equal use of NPs (81%) and MBPs (79%) was noted among their patient population.⁸

Given the apparent interest in IM among the plastic surgery patient population, we sought to conduct a systematic review of the literature examining use of IM in the care of plastic surgery patients and to summarize high-level evidence clinical recommendations. Moreover, we sought to provide publication trends of IM literature, including prevalence of publications by IM content area, type of journal, and year of publication.

MATERIALS AND METHODS

We performed our systematic review in accordance to the guidelines set out in the Preferred Reporting Items for Systematic Reviews and Meta-analyses statement.⁹

Search Strategy

In the month of January 2017, a comprehensive literature search of MEDLINE, PubMed, and EMBASE databases was conducted by 2 separate authors (B.N.N.T. and Q.Z.R.) for

studies published from database inception through December 2016 on the use of IM in the form of NPs or MBPs in plastic and reconstructive surgery patients. Search terms included 65 IM interventions from the 2013 American Board of Integrative Health Medicine Curriculum.¹⁰ The American Board of Integrative Medicine under the American Board of Physician Specialties is the only board certification available for IM out of the 3 main certifying boards in the United States (American Board of Medical Specialties, American Osteopathic Association Bureau of Osteopathic Specialists, and American Board of Physician Specialties).¹⁰ The 43 NP terminologies included “herbal,” “herbal therapy,” “supplements,” “herbal supplements,” “dietary supplements,” “natural products,” “probiotics,” “vitamins,” “multivitamin,” “vitamin B,” “vitamin D,” “vitamin E,” “calcium,” “fish oils,” “green tea,” “caffeine,” “garlic,” “glucosamine,” “coenzyme Q,” “ginger,” “onion,” “ginkgo biloba,” “chondroitin,” “arnica,” “milk thistle,” “echinacea,” “ginseng,” “grapefruit,” “dehydroepiandrosterone,” “rosemary,” “saw palmetto,” “valerian,” “St. John’s wort,” “goldenseal,” “licorice,” “eicosapentaenoic acid,” “feverfew,” “plantain,” “uzara root,” “hawthorn berry,” “ephedra,” “kava,” and “kyushin.” The 22 MBP terminologies included “mind-body,” “minerals,” “massage,” “meditation,” “hypnosis,” “yoga,” “chiropractor,” “prayer,” “dietary modification,” “aromatherapy,” “guided imagery,” “homeopathy,” “reflexology,” “tai chi,” “energy healing,” “ayurveda,” “biofeedback,” “naturopathy,” “qi gong,” “chelation,” “acupressure,” and “acupuncture.” We included the above listed terms independently with each of the terms “plastic surgery,” “integrative medicine,” “alternative medicine,” “holistic medicine,” and “complementary medicine.”

Study Selection

We included studies that (1) examined the clinical application of IM in the plastic surgery population, (2) had 1 or more IM modalities as the primary intervention or subject matter, (3) involved human subjects, and (4) were written in English. Two independent reviewers (B.N.N.T. and Q.Z.R.) applied inclusion criteria to all the studies identified from our literature search. Studies were selected using titles and abstracts. Full-text versions of the studies were then retrieved. In cases of disagreement, we used a consensus method among the 2 reviewers, and a third arbiter (D.S.) as needed. We included randomized controlled trials (RCTs), prospective nonrandomized controlled and uncontrolled studies, retrospective cohort and case-control studies, and case report/series. Journal correspondences, literature reviews, and epidemiological survey studies were not included.

Assessment of Methodology, Risk of Bias, and Evidence-Based Clinical Practice Guidelines

The level of evidence of each study was graded using the American Society of Plastic Surgeons (ASPS) Rating Levels of Evidence and Grading Recommendations.¹¹ Depending on type of study (prognostic, diagnostic, or therapeutic) and quality, each study was assigned a corresponding level of evidence according to the ASPS Evidence Rating Scales, with a score of I being the highest and V being the lowest. Two authors independently scored the evidence level of each study and convened to resolve any disparity on evaluations prior to reaching a unifying consensus.

Data Extraction and Outcome Measure

Extracted data included author, publication date, publication journal, type of study, methods of analysis, source of information, subtypes of integrated medicine study, primary and secondary outcomes, and overall conclusion.

Conclusions of studies were recorded as “beneficial,” “harmful,” or “neutral” upon systematic analysis of each study in its entirety. “Neutral” was assigned when the study conveyed factual findings that were neither beneficial nor harmful. Two independent reviewers (B.N.N.T. and Q.Z.R.) extracted the above data. Disagreement was discussed, and a third reviewer (D.S.) was available for consultation when required.

Statistical Analysis

In our bibliometric analysis of publication trends, we used GraphPad Prism 7.0 (GraphPad Software, Inc, La Jolla, Calif) to perform Fisher exact tests to compare the group publication characteristics of NP and MBP studies. $P < 0.05$ was defined to be the threshold for tests to be considered statistically significant.

RESULTS

Sixty-one abstracts were identified from the literature search after an initial screening of 1600 studies. Full-text studies were obtained, of which 29 met inclusion criteria for data extraction and analysis. These 29 studies could be classified into a specific level of evidence, with 13 NP and 16 MBP studies (Fig. 1).

Of 13 studies on NPs, 8 (62%) were RCTs, 3 (23%) were nonrandomized controlled prospective studies, and 2 (15%) were case reports. Of these, there were 11 (85%) level II and 2 (15%) level V evidence studies, with no level I, III, or IV evidence studies (Table 1). In regard to patient population, there were 11 studies (85%) for cosmetic and 2 studies (15%) for reconstructive surgery. Level II evidence was available for the utilization of arnica, onion extract, vitamin E, and melilotus in plastic surgery patients. In these studies, the size of the study cohorts ranged from 10 to 200, and the duration of follow-up or study ranged from 7 days to 1 year. Of the 11 level II evidence studies, 3 (27%) failed to elicit significant differences between treatment and control groups at their primary end points, whereas 8 (73%) showed significant benefits. Reproducible level II studies^{14,16} support the use of arnica in rhinoplasty patients for reduction in early postoperative ecchymosis and edema. Similarly, reproducible level II evidence^{17–20} supports the use of onion extract for improvement in scar pigmentation. Two level V evidence studies, assessing ginkgo and kelp, reported on the harmful effects of these NPs, primarily in regard to increasing the risk of bleeding when taken preoperatively (Table 1).^{23,24}

Of the 16 studies on MBPs, 5 (31%) were RCTs, 2 (13%) were nonrandomized uncontrolled prospective studies, 1 (6%) was a retrospective cohort study, and 8 (50%) were case series and case reports. There were 7 (44%) level II evidence, 1 (6%) level III evidence, 4 (25%) level IV evidence, and 4 (25%) level V evidence studies, with no level I evidence studies (Table 2). In regard to patient population, there were 9 studies (56%) for cosmetic and 7 studies (44%) for reconstructive surgery. Ten studies (63%) studied hypnosis, whereas 5

studies (31%) evaluated the use of acupuncture. One article (6%) studied the combined administration of massage and meditation in breast reconstruction patients.³¹ Level II evidence studies available for all of the above listed interventions were deemed to have beneficial conclusions. Cohort size ranged from 18 to 337, and study follow-up duration ranged from 2 hours to 9 months. Of the 7 level II evidence studies, all attained significant differences between treatment and control groups. Reproducible level II evidence supports the efficacy of hypnosis in reducing perioperative anxiety.^{25,26} Similarly, the evidence supports the use of acupuncture in improving postoperative nausea.^{28,29} However, 1 level V evidence study reports on the risk of infection in acupuncture use.⁴⁰ This was a case report of a patient who experienced cervical necrotizing fasciitis after acupuncture treatment for fat accumulation in the submental area.

In comparing publication characteristics of NP and MBP studies, there was no significant difference in the number of NP versus MBP studies with positive conclusions (62% vs 88%, $P = 0.192$) (Fig. 2). There was also no significant difference in the number of NP versus MBP studies published in core or major plastic surgery journals as defined by OMICS International (69% vs 31%, $P = 0.066$) (Fig. 3).⁴¹ Ninety-two percent of studies on NP usage among plastic surgery patients were published after the year 2000 compared with 44% of MBP studies in the same time frame ($P = 0.008$) (Fig. 4).

DISCUSSION

Our systematic review of the literature reveals a high level of reproducible evidence supporting the use of 4 IM modalities in the care of plastic surgery patients. Specifically, arnica can markedly reduce postoperative edema following rhinoplasty.^{14,16} Onion extract is effective to improve hyperpigmentation in scars.^{17–20} Hypnosis is effective in relieving anxiety and fear in the perioperative care of plastic surgery patients.^{25,26} Acupuncture can be adopted to improve postoperative nausea and vomiting.^{28,29} With regard to publication trends, we found that publications of NP studies have been markedly outpacing those of MBP practices since the year 2000.

Despite the low number of recent and high-level evidence publications for NP usage in the plastic surgery population, the vast majority of studies do show a beneficial effect on outcomes, in particular for arnica in reducing postrhinoplasty edema and onion extract products in improving scar pigmentation.^{14,16–20} While mechanisms of action are not well elucidated, biochemical studies have established constituent properties that are thought to be active. For example, the main constituent of arnica is helenalin, which has reported anti-inflammatory and analgesic effects that may contribute to reduction of postoperative edema. For onion extract products, the onion extract component has multiple effects, including hydration of scar tissue and antibacterial, anti-inflammatory, and fibrinolytic properties.^{17–20} Similarly, silicone has been described as beneficial for scars potentially through hydrating the wound and increasing static charge, in products such as Cybele Scagel. Significantly better outcomes across measures have been reported with onion extract products combined with silicone than when using either component independently.^{17,19,20}

Similarly, although there are few recent MBP publications, the studies do show promise among patients who undergo plastic surgery. The study of hypnosis and acupuncture as adjunct methods of sedation has demonstrated a lowered inflammatory response (interleukin 6) after surgery compared with general anesthesia, decreased preoperative anxiety, reduced intraoperative time, decreased postoperative analgesia use, and more rapid recovery.^{28,29,32,42,43} A large body of literature has explored the mechanisms of acupuncture, most notably involvement of the endogenous analgesia system, as well as other neuroendocrine, autonomic, and connective tissue influences.^{39,44} Similarly, recent advances in the understanding of neural mechanisms within both biopsychosocial and neurophysiological models of hypnosis have advanced our mechanistic understanding of hypnosis.^{45,46}

We propose openness, further education, and inquiry among plastic surgeons to better understand their patients' interests and needs with respect to complementary and integrative therapies. As many patients already engage in the practice of IM, a surgeon with knowledge in this field can responsibly counsel, encourage, or discourage use of specific therapies, while conveying cultural humility and encouraging patient compliance in preparation for surgery.⁴⁷ If this productive interaction is able to alleviate what one terms the "catastrophizing" mindset of preoperative patients, it could translate into improvement in postoperative discomfort and patient satisfaction.³⁴ In particular, many MBPs are versatile to employ, can easily be adjusted to patient needs, and have minimal detriments.

Despite the reported benefits of NPs and MBPs, there must also be consideration for potential harmful effects of IM. In studies with an undefined level of evidence, reported theoretical risks of popular herbal remedies included perioperative hypertension (ginkgo and ginseng),⁴⁸ hemostasis complication (garlic and ginger),⁴⁹ and potential anesthesia risks (St John's wort, kava, and valerian).⁵⁰ Studies included in our systematic review questioned the safety of NP use and cautioned plastic surgeons on their application in perioperative patients, especially for garlic and ginkgo use because of a risk of bleeding complications.^{51,52} On the other hand, for MBPs, 1 study reported acupuncture as being a potential risk of infection.⁴⁰ However, these harmful effects were reported in a limited number of studies with neutral findings as cautionary remarks or with low level of evidence. Moving forward, plastic surgeons should revisit IM to be aware of not only literature describing the potential benefits to improve outcomes, but also those describing harmful effects to optimize patient safety.

Our findings regarding publication trends may serve as a point of reference for future studies investigating IM. The significantly greater number of NP studies compared with that of MBP studies published after year 2000 may indicate 2 important points. For one, this may indicate the general interest of surgeons and patients, especially given the large range of available products and the concern for adverse effects. Second, this could be indicative of the difficulty in publishing scientific MBP studies, especially given the large range of confounding variables and lack of standardization for such interventions. This may be further supported by the fact that, in our study, a greater proportion of NP studies compared with that of MBP studies were level II evidence. Research in the field should continue not only efforts in elucidating the effects of NPs, but also focus on conducting high-level MBP studies.

The main limitation of our study lies in the inherent limitations of the available literature. In general, there were relatively few studies that could be meaningfully evaluated, with several modalities that had 3 or fewer studies. In our search, we identified several publications not meeting inclusion criteria with an undefined level of evidence despite many being published in high-impact plastic surgery core journals. These often represented insightful reviews, stressing the importance of determining NP use in perioperative plastic surgery patients with cautions on theoretical risk of bleeding, hypertension, and dry eyes, although these publications did not contain empirical data that could be evaluated. Another limitation is the fact that our search criteria focused only on IM interventions used explicitly by plastic surgery patients. This may have excluded studies that investigated outcomes related to plastic surgery, such as scar reduction or pain management in other populations.

CONCLUSIONS

Arnica, onion extract, hypnosis, and acupuncture have been demonstrated to be effective adjuncts in the care of the plastic surgery patient. Studies evaluating MBPs such as acupuncture and hypnosis in plastic surgery patients have demonstrated promising results and are a potential area for future further study.

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FIGURE 1.
Preferred Reporting Items for Systematic Reviews and Meta-analyses study inclusion
flowchart.

FIGURE 2.
Distribution of studies by general conclusions.

FIGURE 3.
Distribution of studies by source journals.

FIGURE 4.
Distribution of studies by year of publication.

TABLE 1.

Included Studies Investigating Natural Products by ASPS Evidence Level

Author	Year	Journal	Study Type	Patient Population	N	Mean Age/ Age Range	Dosage	Duration of Follow-up	Statistical Outcome	Conclusion
Level II										
Amica										
Jeffrey Belcher ¹²	and 2002	<i>Alternative Therapies in Health and Medicine</i>	RCT	Carpal tunnel syndrome	37	NR	Oral (D6 tablet with 1 molecule of original substance for each 106 molecule of 90% alcohol); 3 tablets 3 times daily for 2 wk from day of surgery Topical (5% amica, 10% weight per volume of ethanolic extract, and whole plant [50%]); 3 times daily for 2 wk 72 h after surgery	2 wk	Comparable grip strength and wrist circumference. Modest reduction in pain after 2 wk in the amica group ($P < 0.03$)	Neutral
Seeley et al ¹³	2006	<i>Archive Facial Plastic Surgery</i>	RCT	Rhytidectomy	29	NR	Oral: first dose taken on morning of surgery, then every 8 h for 4 d	2 wk	Subjective difference in ecchymosis ($P > 0.05$). Objective color difference only on days 1 ($P = 0.005$) and 7 ($P < 0.001$)	Neutral
Totonchi and Guyuron ¹⁴	2007	<i>Plastic and Reconstructive Surgery</i>	RCT	Rhinoplasty	48	15–65	Oral: 3 times daily for 4 d	8 d	Significant improvement in edema early postoperative with Amica treatment ($P < 0.0001$) after 8 d	Beneficial
Van Exsel et al ¹⁵	2016	<i>Plastic and Reconstructive Surgery</i>	RCT	Blepharoplasty	116	55.1	Topical (10% containing 30 g of mother tincture per 100 g, corresponding to 10 g); twice daily for 1 wk	6 wk	No statistical significance in postoperative ecchymosis, erythema, swelling, or pain of the eyelids ($P = 0.07$), or patient satisfaction ($P = 1$) with recovery or outcome in amica treatment arm	Neutral
Simsek et al ¹⁶	2016	<i>Plastic and Reconstructive Surgery</i>	RCT	Rhinoplasty	108	27.4	Topical: 4 times daily for 10 d	10 d	Ecchymosis significantly less compared with the control subjects on postoperative days 1, 5, and 7 ($P < 0.05$)	Beneficial
Onion extract										
Hosnutter et al ¹⁷	2007	<i>Journal of Wound Care</i>	Nonrandomized, controlled, prospective	Scar	60	40.3	Topical: 4 times daily for 6 mo	6 mo	Onion extract significantly improves scar color ($P < 0.01$), overall improvement	Beneficial

Author	Year	Journal	Study Type	Patient Population	N	Mean Age/Range	Dosage	Duration of Follow-up	Statistical Outcome	Conclusion
Karagoz et al ¹⁸	2009	Burns	RCT	Scar	32	3–55	Topical: twice daily for 6 mo	6 mo	when combined with silicone gel sheet Contractubex (onion extract, allantoin, heparin) associated with significant improvement in treatment score ($P < 0.05$) with 60% of good to excellent response	Beneficial
Jenwitheesuk et al ¹⁹	2012	International Wound Journal	RCT	Scar	54	49.9	Topical (3 g): applied day 7 after surgery, twice daily for 12 wk	12 wk	Improvement of hyperpigmentation in treatment group ($P < 0.05$)	Beneficial
Chuangsuwanich et al ²⁰	2013	Aesthetic Plastic Surgery	RCT	Split-thickness skin graft	10	49	Topical (1 g): twice daily for 12 wk after skin epithelialization	12 wk	Scalpel group achieved lower Vancouver Scar Score of 3.0 compared with placebo at 5.9 at 12 wk ($P < 0.001$)	Beneficial
Vitamin E										
Baker ²¹	1981	Plastic and Reconstructive Surgery	Nonrandomized, controlled prospective	Breast augmentation	200	NR	Oral (1000 IU): first dosage 1 wk before surgery, twice daily for minimum 1 y (follow-up)	1 y	19% contracture in treated vs 30% in untreated groups, $P < 0.05$	Beneficial
Mellilotus										
Xu et al ²²	2008	Aesthetic Plastic Surgery	Nonrandomized, controlled, prospective	Rhinoplasty and blepharoplasty	46	18–37	Oral (100 mg): 3 times daily for 7 d	7 d	Significant postoperative day 7 reduction in upper ($P = 0.038$), lower eyelids ($P = 0.042$) and paranasal ecchymosis ($P = 0.021$) compared with control and steroid groups	Beneficial
Level V										
Ginkgo										
Mesquita ²³	2006	Plastic and Reconstructive Surgery	Case report	Blepharoplasty	1	68	Oral	NR	Intraoperative bleeding and postoperative hematoma	Harmful
Kelp										
Mohan and Lahiri ²⁴	2014	Aesthetic Plastic Surgery	Case report	Abdominoplasty	1	39	Oral	10 mo	Increased bleeding risk perioperatively	Harmful

TABLE 2.

Included Studies Investigating Mind-Body Practices by ASPS Evidence Level

Author	Year	Journal	Study Type	Patient Population	Mean Age/Ag e Range	Dosage	Duration of Follow-up	Statistical Outcome	Conclusion
Level II									
Hypnosis									
Matheson and Drever ²⁵	1990	<i>Annals of Plastic Surgery</i>	Nonrandomized, uncontrolled, prospective	Breast reconstruction	48.6	Tape recordings: sessions 1–3 times a week, or more often than 1–3 times a week	NR	Achievement of rapport, relaxation and depth of hypnosis ($P < 0.05$)	Beneficial
Hermes et al ²⁶	2005	<i>Journal of Craniomaxillofacial Surgery</i>	Nonrandomized, uncontrolled, prospective	Maxillofacial surgery	13–87	Recordings with CD player: twice between preoperative appointment and operation, once directly before surgery	NR	94.3% success in achieving relaxation, inhibited motor skills, tolerance to invasive surgery, postoperative anxiety	Beneficial
Ginandes et al ²⁷	2003	<i>American Journal of Clinical Hypnosis</i>	RCT	Breast reduction	38.9	Audiotapes: 8 weekly, 30 minute, individual sessions starting 2 wk prior to operation	9 mo	Improved wound healing over time ($P < 0.001$). Hypnosis group self-rated having healed the most	Beneficial
Acupuncture									
Larson et al ²⁸	2010	<i>Plastic and Reconstructive Surgery</i>	RCT	Elective plastic surgery	NR	Acupuncture (transcutaneous electrical acupoint stimulation) device: activation after general anesthesia and deactivation as patient emerged from anesthesia	2h	Lower nausea scores at 30 and 120 min in treatment group ($P < 0.05$), patients post-breast surgery needed less fentanyl	Beneficial
White et al ²⁹	2005	<i>Anesthesia & Analgesia</i>	RCT	Breast reduction, facial cosmesis, abdominoplasty	41	Acupuncture (transcutaneous electrical acupoint stimulation) device: Activation preoperatively for 30 min before, postoperatively for 72 h after, or both	3d	Improved recovery and 24-h VRS nausea score, 24-h complete response rate and resumption of physical activities, 72-h satisfaction with antiemetic therapy ($P < 0.05$)	Beneficial
Pohodenko-Chudakova ³⁰	2005	<i>Journal of Craniomaxillofacial Surgery</i>	RCT	Maxillofacial surgery	35–40	Acupuncture analgesia: performed 15–30 min before surgery, or during and after surgery	NR	62% complete alleviation of postoperative pain and 38% partial alleviation	Beneficial
Massage and meditation									

Author	Year	Journal	Study Type	Patient Population	Mean Age/Ag e Range	Dosage	Duration of Follow-up	Statistical Outcome	Conclusion
Dion et al ³¹	2015	<i>Complementary Therapies in Clinical Practice</i>	RCT	Breast reconstruction	38 47.7	Massage for 20 min on postoperative days 1, 2, 3; 15-min video, followed by meditation, followed by 20-min massage with meditation midway on postoperative days 1–3	3 wk	Massage alone improved Perceived Stress Scale-14 significantly from baseline 3 wk postoperatively ($P=0.01$) but addition of meditation to massage not more beneficial than massage alone ($P>0.05$)	Beneficial
Level III									
Hypnosis									
Faymonville et al ³²	1995	<i>Regional Anesthesia</i>	Retrospective cohort	Elective plastic surgery	NR 337	Indirect suggestions: dependent on patient nonverbal behavior	NR	Improved intraoperative anxiety ($P<0.01$), intraoperative pain intensity ($P<0.001$), surgical condition ($P<0.001$), less intraoperative alfentanil requirement ($P<0.002$)	Beneficial
Level IV									
Acupuncture									
Franklyn ³³	1974	<i>American Journal Chinese Medicine</i>	Case series	Rhytidectomy, blepharoplasty, breast augmentation	NR 60	Electro-puncture acupuncture: 10–30 min of electrical stimulation before surgery, up to 50 Hz	NR	Safe and effective for anesthesia	Neutral
Hypnosis									
Tucker and Virnelli ³⁴	1985	<i>Plastic and Reconstructive Surgery</i>	Case series	Reconstructive surgery	1 6–37	Hypnotic psychotherapy: prior to procedure	NR	Safe and effective in producing relaxation intraoperatively	Beneficial
Scott ³⁵	1975	<i>American Journal of Clinical Hypnosis</i>	Case series	Reconstructive surgery	11 17–67	Hypnotic psychotherapy with verbal cues and tape recordings, as well as autohypnosis: preoperatively	NR	Reduced need for postoperative analgesics	Beneficial
Scott and Holbrook ³⁶	1981	<i>British Journal of Plastic Surgery</i>	Case series	Elective plastic surgery	7 22–65	Hypnotic psychotherapy: 4–10 sessions	3 mo to 4 y	Facilitates patients' acceptance of operative results	Beneficial
Level V									
Hypnosis									
Kelsey and Barron ³⁷	1958	<i>British Medical Journal</i>	Case report	Reconstructive surgery	1 24	Hypnotic psychotherapy with verbal cues: preoperatively	NR	Safe and effective in maintenance of postural fixation	Beneficial

Author	Year	Journal	Study Type	Patient Population	N	Mean Age/Ag e Range	Dosage	Duration of Follow-up	Statistical Outcome	Conclusion
Zysman and Zysman ³⁸	1983	<i>Journal of American Society of Psychosom</i>	Case report	Rhinoplasty	1	NR	Hypnotic psychotherapy with verbal cues: preoperatively	NR	Decreased intraoperative pain and stress	Beneficial
Bai et al ³⁹	2013	<i>American Journal of Clinical Hypnosis</i>	Case report	Liposuction	1	NR	Audio cassette tape: 5 evenings prior to procedure in 20-min sessions	NR	Self-hypnosis allows complicated motor functions	Beneficial
Acupuncture										
Choi ⁴⁰	2014	<i>Journal of Craniofacial Surgery</i>	Case report	Lipoplasty	1	32	Acupuncture therapy: 2-wk period	3 mo	Deep acupuncture risk of infection	Harmful

VRS, visual rating score.