Top-10 List of Herbal and Supplemental Medicines Used by Cosmetic Patients: What the Plastic Surgeon Needs to Know

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Background: Widespread use of herbal medications/supplements among the presurgical population may have a negative effect on perioperative patient care. Thus, the authors' goal was to identify the prevalence of such use in a cosmetic surgery patient population compared with use among the general public; to assess physician awareness of proper management of these herbal medications/supplements; and to review the literature to provide rational strategies for managing perioperative patients taking these remedies.

Methods: To assess patient ($n = 100$) and general public ($n = 100$) usage rates, open-ended lists of (1) the most common herbal medications/supplements and (2) homeopathic treatments were compiled. Board-certified plastic surgeons ($n = 20$) were then given the same list of herbs/supplements and surveyed on their awareness of these treatments and perioperative side effects.

Results: The usage rate for cosmetic versus public surveys for herbal medicines/supplements was 55 percent versus 24 percent ($p < 0.001$), with 35 percent versus 8 percent ($p < 0.001$) engaging in homeopathic practices, respectively. Cosmetic patients' top four herbal/supplements of usage were chondroitin (18 percent), ephedra (18 percent), echinacea (14 percent), and glucosamine (10 percent). The top four used by the general public were echinacea (8 percent), garlic (6 percent), ginseng (4 percent), and ginger (4 percent). The physician survey demonstrated awareness of 54 percent of the listed supplements/herbal medicines, 85 percent of which were not suggested to be discontinued preoperatively, with only ephedra achieving 100 percent physician discontinuation preoperatively.

Conclusions: Herbal medicines and supplements displayed greater prevalence in the cosmetic surgery population than in the population at large. Furthermore, side effects and potential complications warrant addressing these remedies as pharmaceuticals rather than as safe and "natural." Thus, a descriptive "top-10" list with perioperative recommendations was compiled for the plastic surgeon. (*Plast. Reconstr. Surg.* 117: 436, 2006.)

In the past decade, the vast increase in the use of alternative medicine, defined as healing methods "not generally taught in medical schools or typically practiced in hospitals," has called for the reassessment of safety precautions by health care professionals.[1–5] In particular, the use of herbal supplements should be carefully monitored for both the physiologic effects and interactions with other prescription or over-the-counter medications. Herbal supplements are considered harmless by the lay public because of their association with the word "natural" and remain virtually unregulated by the Food and Drug Administration. However, the word "drug" is derived from a Middle English word meaning "root." As such, many drugs are derived from leaves, roots, bark, or other parts of plants. For example, white willow bark and meadowsweet plant are the basis for salicylic acid (a precursor to aspirin); foxglove plant is the basis for digitalis; cinchona bark is the precursor to quinine compounds; and periwinkle provides the chemotherapeutic agent vincristine. Thirty percent of all modern conventional medicines are derived from plants.[6]

In cosmetic patients, the degree to which herbal medicines and supplements are used is

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not known. It is feared that many cosmetic patients may not reveal their use of these agents because more than 70 percent of all medical patients do not reveal their usage to treating physicians.[7,8] To study this, we compared surveys on the use of herbal medicine and supplements by the cosmetic surgery population to that by the general population. In addition, plastic surgeons' knowledge on these homeopathic remedies was tested. We also detailed the contraindications for the most commonly used herbs and supplements and provided perioperative recommendations for the cosmetic surgeon. We include, for easy office reference, a "top-10 list" of the most prevalent herbal medicines and supplements with potentially dangerous side effects and appropriate perioperative recommendations.

Use of alternative medicines is widespread among the general public and not an integral part of the hospital or medical education. Thus, the following should bring to the forefront awareness of purpose, side effects, and complications that are associated with some frequently used herbs and supplements.

PATIENTS AND METHODS

Patient and General Population Surveys

Cosmetic surgery patients encountered consecutively at the Division of Plastic and Reconstructive Surgery at the University of California were surveyed ($n = 100$). In addition, adults aged 40 years or older with equal distribution of sex from the general population of five cities within Los Angeles were randomly surveyed with the same questionnaire ($n = 100$). The five cities selected were those most commonly encountered in our cosmetic clinic.

In the survey, a list of the 13 carefully selected herbal medicines and dietary supplements was included. The herbal medicines were echinacea (*Echinacea augustfolia*), ephedra (Ma-huang), garlic (*Allium sativum*), ginger, ginseng (*Eutherococcus senticosus*), gingko (*Gingko biloba*), goldenseal (*Hydrastasis canadenis*), kava (*Piper methysticum rhizoma*), milk thistle (*Silybum marianus*), St. John's wort (*Hypericum perforatum*), and valerian (*Valeriana officinalis*). The dietary supplements were chondroitin and glucosamine. Herbs and supplements in this list were chosen either based on national sales according to Information Resources, Inc., or for their high potential for perioperative complications. This list was left open ended such that additional herbal medicines or supplements could be written in the blank space provided. In addition, homeopathic medicinal practices (e.g., acupuncture, chiropractic manipulation, hypnosis, massage, meditation, yoga) were also listed in a similar open-ended manner. Both sections also listed choices corresponding to how often subjects engaged in the practice (once per day; twice per day; once per week; twice per week) or again a blank space labeled "other" for the patient to fill in. Finally, open-ended questions were asked at the end of each section for the patient to include any additional information.

The data from the surveys were collected into a database (MS Access; Microsoft Corp., Redmond, Wash.) and the following information was gathered: usage rates for herbal medicines/supplements and for homeopathic practices among cosmetic surgery patients and among the public, and patterns between the two. A Fisher's exact test was used for comparison.

Physician Survey

An additional survey for plastic surgeons, certified by the American Board of Plastic Surgeons, was conducted ($n = 20$). This survey contained three sections. The sections were designed to assess (1) physician awareness of herbal medicines and supplements (as listed in the patient's survey); (2) knowledge of the perioperative complications associated with these treatments; and (3) appropriate recommendations for patient discontinuation preoperatively. Again, the data from the surveys were collected into a database (MS Access) and analysis was performed.

RESULTS

Cosmetic Patient Usage

Our surveyed cosmetic patient population consisted of five men and 95 women with a mean age of 46.7 ± 11.2 years. Procedures performed included 42 abdominoplasties, 25 breast augmentations, 11 mastopexies, two ear reconstructions, 17 liposuctions, 30 face lifts, three chin augmentations, three rhinoplasties, and two corrections for pectus excavatum. Forty-seven percent of patients underwent more than one cosmetic procedure at the time of operation.

A 55 percent rate of usage of herbal medicines was observed among these cosmetic patients. Of the 55 percent taking herbal remedies/supplements, 100 percent took at least two remedies and at least one on a daily basis. Chondroitin (18 percent), ephedra (18 percent), glucosamine (10 percent), milk thistle (4 percent), and garlic (2 per-

cent) were all taken on a daily basis. Echinacea (10 percent) was taken once or twice a week, with 4 percent who took it "occasionally" or "when feeling sick." Goldenseal (4 percent), milk thistle (4 percent), and kava (2 percent) were also taken twice each week. Valerian, St. John's wort, and ginger were not reported taken by our cosmetic patients (Fig. 1).

Thirty-five percent of cosmetic patients engaged in homeopathic practices [acupuncture (7 percent), chiropractic manipulation (3 percent), hypnosis (5 percent), massage (3 percent), meditation (5 percent), yoga (3 percent), and Pilates (2 percent)]. Seventeen percent of cosmetic patients practiced homeopathics at least on a weekly basis, with 12 percent practicing homeopathics of at least two forms.

General Population Usage

Our general population survey consisted of 46 men and 54 women with a mean age of 42.6 ± 13.1 years. Twenty-four percent of the population reported usage of herbal medicines. Of those taking herbal remedies/supplements (24 percent), only 33 percent took at least two and 50 percent took at least one on a daily basis. Echinacea (8 percent) and chondroitin (4 percent) were taken once a day. Garlic was taken either once a day (2 percent) or once a week (4 percent). Ginger (4 percent), ginseng (4 percent), gingko (2 percent), goldenseal (2 percent), and glucosamine (2 percent) were all taken once a week. There was no usage of valerian, St. John's wort, milk thistle, kava, or ephedra (Fig. 1).

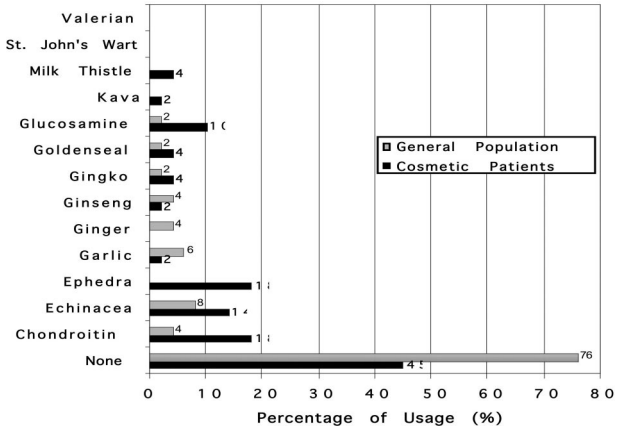

Fig. 1. Daily medicinal supplement usage by cosmetic patients ($n = 100$) versus the general population ($n = 100$). Medicinal supplements are represented along the *vertical axis*, with usage rates represented as percentages of the 100 patients surveyed for each group along the *horizontal axis*. *Filled bars*, cosmetic patients; *shaded bars*, public patients. Numerical percentage usages are listed to the right of each respective bar.

Homeopathic treatment [acupuncture (2 percent), hypnosis (2 percent), meditation (2 percent), yoga (2 percent), and Pilates (2 percent)] was practiced by 6 percent of the population. Four percent of the general population practiced homeopathics at least on a weekly basis and only two percent practiced homeopathics of at least two forms.

Comparison: Cosmetic Patient versus General Population

The usage rate for cosmetic versus public surveys for herbal medicines/supplements was 55 percent versus 24 percent ($p < 0.001$), with 35 percent versus 8 percent ($p < 0.001$) engaging in homeopathic practices, respectively. For the cosmetic patients, the top four herbal medicines of usage in descending order were chondroitin (18 percent), ephedra (18 percent), echinacea (14 percent), and glucosamine (10 percent). For the generalized population, the top four herbal medicines of usage in descending order were echinacea (8 percent), garlic (6 percent), ginseng (4 percent), and ginger (4 percent). Thus, only echinacea was common among the two groups, with 6 percent greater usage by the cosmetic patients. This correlates with the observed difference in usage rates for the cosmetic patients versus the public, respectively.

Physician Survey

The physician survey demonstrated that physicians were aware, by name, of 54 percent of the listed supplements/herbal medicines. However, all physicians correctly knew the side effects of only *one* herbal medicine (ephedra). Chondroitin was identified properly in 30 percent to be associated with bleeding. No other of these herbal medications/supplements was properly identified with their corresponding side-effect profiles. Thus, for 90 percent of the herbal remedies listed, side-effect profiles were not known, yet physicians admitted that they did not recommend stopping 85 percent of herbal medications preoperatively or in the perioperative period. All (100 percent) recommended stopping ephedra for its association with elevated blood pressure and stroke.

DISCUSSION

Interest in alternative medicine has grown rapidly over the past decade and usage among the public has become widespread.[1–5] However, de-

spite the usage and documented physiologic side effects, complementary medicine is not widely taught as a part of medical education; nor, by definition, is it a part of regular patient care in the hospital. This was exemplified by our surgeon survey in which surgeons on average were unable to identify side-effect profiles for 90 percent of the medicinal supplements listed.

Previous studies throughout the United States have shown a 22 percent rate of usage of herbal medicines and supplements.[9] Similarly, our general population survey with similar sex and age distribution as the national survey, although limited to Southern California, showed a 24 percent rate of usage of herbal medicines and supplements. This comparable usage implies that usage in Los Angeles roughly parallels national averages. As such, the cosmetic patients' much greater usage of 55 percent with a female predominance may also correlate with national averages. This was recognized in the physician survey, wherein plastic surgeons perceived an increased usage of herbal medicines and supplements among their cosmetic patients. Most surgeons wished to learn more about the side effects of these remedies commonly used by their patients to prevent avoidable complications. In fact, one plastic surgeon, albeit anecdotal, noted a postoperative hematoma after performing a face lift. On questioning of the woman, the only medicine noted was garlic.

A top-10 list of herbal medicines and supplements commonly used by the cosmetic patient is an easy guide for practitioners (Table 1). What follows details (1) the reason people take these herbal medicines or supplements, (2) the side effect from them, and (3) the perioperative recommendations. To be thorough, a brief commentary is also made on four herbs (saw palmetto, St. John's wort, valerian, and ginger), one supplement (eicosapentaenoic acid), and one vitamin (vitamin E) that did not make our top-10 list but that do have perioperative issues (Table 2).

Chondroitin and Glucosamine

Chondroitin and glucosamine are supplements that are often administered together. They are both components of the normal cartilaginous matrix and as such are used to treat osteoarthritis. Potential complications from these supplements arise from there structure. Chondroitin and heparin are similar in chemical composition and thus researchers speculate that people may suffer bleeding complications from chondroitin, particularly when it is used in combination with other blood-thinning medications. Glucosamine contains polypeptide-p, known to be plant insulin that may thus mimic human insulin, artificially elevating levels and causing hypoglycemia. This effect is enhanced by glucosamine's known inhibition of glucose transport and glycolysis. Thus, to avoid perioperative risk of bleeding and hypoglycemia, it is recommended that usage of these supplements be discontinued. Exact time is unknown, and thus recommendations are based on guidelines from the American Society of Anesthesiologists, which advises that all herbal medicines without formal study be discontinued at 2 to 3 weeks before an elective surgical procedure.[10]

Ma-huang (*Ephedra sinica*)

Ephedra has been known to promote weight loss, increase energy, and treat respiratory tract conditions, such as asthma and bronchitis. Ephedrine, a chemical contained in ephedra, has medical uses, mostly in operating rooms and intensive care units. It is sympathomimetic agent and thus causes positive inotropic and chronotropic responses to raise blood pressure and heart rate, respectively; dilates bronchioles; and increases metabolic rate. As such, it is contained in many over-the-counter "slimming preparations." Side effects such as psychiatric disturbances, heart attack, cardiac dysrhythmias associated with volatile general anesthetic agents (e.g., halothane) and cardiac glycosides (e.g., digitalis), stroke, and even death. As such, it has been outlawed.[11–16] Of note, patients taking ephedra under general anesthesia can have severe hypotension that can be controlled with phenylephrine instead of ephedrine. If a patient is still using ephedra, health care personnel should inform the person of the drug's adverse effects and discontinue usage at least 24 hours before perioperative care.[17]

Echinacea (*Echinacea augustfolia*)

Echinacea is often used for the prevention and treatment of viral, bacterial, and fungal infections, chronic wounds and ulcers, and chronic arthritis.[18,19] Unlike over-the-counter decongestants or antihistamines, alkylamine and polysaccharide constituents of echinacea posses significant in vitro and in vivo immunostimulation properties because of enhanced phagocytosis and nonspecific T-cell stimulation. It is for this reason that it is contraindicated in systemic and autoimmune disorders.[20] In fact, the immunostimulatory effects can offset immunosuppressive actions of corticosteroids and cyclosporine. Side effects include

Table 1. Top-10 List of Medicinal Herbs/Supplements

Rank*	Common Name and Dose	Common Uses (Marketing)	Surgical Caution	Perioperative Recommendations
1	Chondroitin (400–800 mg BID)	Osteoarthritis	Perioperative bleeding	D/C 2–3 weeks before surgery§
2	Ephedra‡ (2.7–3.0 g QD)	Energy, weight loss, asthma	Hypertensive, cardiac instability with anesthetics	D/C ≥ 1 day before surgery
3	Echinacea (2.7–3.0 g QD)	Infections, ulcers, arthritis, to prevent bruising	Potentiate barbiturate and halothane toxicity, allergic reaction, immunosuppression	D/C 2–3 wk before surgery§
4	Glucosamine (1500 mg QD)	Osteoarthritis	Hypoglycemia	D/C 2–3 weeks before surgery§
5	Ginkgo biloba (120–240 mg QD)	Cognition (dementia), vascular disease, tinnitus, asthma, colds, anti-inflammatory	Postoperative sedation, perioperative bleeding	D/C ≥ 1.5 days before surgery
6	Goldenseal (125–500 mg BID)	Laxative, anti-inflammatory, infection	Volume depletion, postoperative sedation, photosensitization	D/C 2–3 wk before surgery§
7	Milk thistle (100–300 mg TID)	Hepatoprotective, anti-inflammatory	Volume depletion (choleretic activity)	D/C 2–3 weeks before surgery§
8	Ginseng (0.5–2.0 g QD root) (200–600 mg QD extract)	Antioxidant, energy, lowers blood glucose	Perioperative bleeding; avoid use in children and pregnant women	D/C ≥ 1 week before surgery
9	Kava (2.7–3.0 g QD)	Anxiolytic, muscle relaxant	Postoperative sedation	D/C ≥ 1 day before surgery
10	Garlic (600–900 mg QD) (8 mg QD oil) (4 g QD cloves)	Infection, hypertension, hypercholesterolemia, cancer prevention	Perioperative bleeding	D/C ≥ 1 wk before surgery

D/C, discontinue; MAOIs, monoamine oxidase inhibitors; BID, two times per day; TID, three times per day; QD, every day.
This table may be cut out or copied for quick office reference.
*Ranked order of supplements from cosmetic patient survey information (1 = most, 10 = least prevalent usage).
†Gram values for powder unless otherwise specified.
‡As of April 12, 2004, the U.S. Food and Drug Administration has banned the use ofephedra.
§According to recommendations from the American Society of Anesthesiologists.

Table 2. Additional Remedies with Perioperative Concerns

Common Name and Dose*	Common Uses (Marketing)	Surgical Caution	Perioperative Recommendations
Saw palmetto (2.7–3.0 g QD)	Sedative, anti-inflammatory, benign prostatic hypertrophy, aphrodisiac	Perioperative bleeding	D/C 2–3 weeks before surgery†
St. John's wort (2.7–3.0 g QD)	Depression, anxiety, pain, insomnia, infection	Postoperative sedation, cardiovascular collapse, photosensitization, swelling	D/C ≥ 5 days before surgery; do not combine with MAOIs
Valerian (400–900 mg QD)	Insomnia, anxiolytic	Postoperative sedation	D/C ≥ 1 week before surgery
Ginger (1–4 g QD)	Antiemetic, sore throat, anti-inflammatory	Perioperative bleeding	D/C 2–3 week before surgery†
Eicosapentaenoic acid (1–2 g QD)	Cardioprotective, skin disorders, asthma	Perioperative bleeding	D/C 2–3 week before surgery†
Vitamin E (200–800 IU QD)	Cardioprotective, cancer (antioxidant)	Perioperative bleeding, prolonged wound healing	D/C 2–3 week before surgery†; population dependent

D/C, discontinue; MAOIs, monoamine oxidase inhibitors; QD, every day.
This table may be cut out or copied for quick office reference.
*Gram values for powder unless otherwise specified.
†According to recommendations from the American Society of Anesthesiologists.

unpleasant taste, gastrointestinal upset, headache, dizziness, and potential allergic reactions.[20,21] Prolonged use of this drug (>8 weeks) has been documented to cause tachyphylaxis through an unknown mechanism. Echinacea is also an inhibitor of cytochrome P450 3A4 and sulfotransferase and as such can potentiate toxicity of drugs that are metabolized by means of these pathways. Thus, the theoretical risk of both poor wound healing and infection from nonspecific immunostimulation and excess sedation from toxicity of benzodiazepines and barbiturates warrant discontinuation 2 to 3 weeks before surgery according to American Society of Anesthesiologists guidelines.[10]

Gingko (*Gingko biloba*)

A standardized extract of ginkgo (Egb 761) has become widely used for its efficacy in treating peripheral and cerebral circulatory disturbances, including claudication and memory impairment (e.g., Alzheimer's disease).[22] The herb has the ability to inhibit platelet-activation factor and modulate nitric oxide and possesses an anti-inflammatory effect. With these effects come a few disturbing case reports. *Gingko biloba*–induced spontaneous hyphema (bleeding from the iris in the anterior chamber of the eye), subarachnoid hemorrhage, and spontaneous bilateral subdural hematomas have all been described.[23–26] Thus, concomitant use with anticoagulants should be avoided. Other side effects include headache, nausea, gastric symptoms, diarrhea, and allergic skin reactions.[27,28] Discontinuation is recommended at least 36 hours before surgery.[17]

Goldenseal (*Hydrastasis canadenis*)

Goldenseal is used as a mild laxative and anti-inflammatory and to treat infection. It may be taken internally or applied externally. Active ingredients are thought to be alkaloid compounds called hydrastine and berberine. Its usage for intestinal problems may increase blood pressure or cause electrolyte imbalance from diarrhea.[29] This is important during the perioperative period, when volume depletion is already common. Furthermore, inhibition of cytochrome P450 3A4 metabolism has also been demonstrated in vitro and, as such, concern is raised about potentiation of drugs metabolized by it. Surgically, this correlates with possible barbiturate and benzodiazepine toxicity, leading to excess postoperative sedation. In addition, photosensitivity reactions have been documented. Exposure to ultraviolet A or laser light is thus contraindicated.[30,31] Other side effects include irritation of skin, mouth, throat, and

vagina from high-dose exposure.[21,29] Thus, with no formal bioavailability studies suggested, time of discontinuation before surgery is 2 to 3 weeks according to the American Society of Anesthesiologists.[10]

Milk Thistle (*Silybum marianum*)

Milk thistle has emerged for its hepatoprotective, anti-inflammatory, and regenerative properties. The extracted substance "silymarin" is the most widely studied. Silymarin mediates two primary sites of action that affect the liver: the outer surface of the hepatocyte cell membrane and the ribosomal proteins (glutathione produced). Silymarin also has anti-inflammatory properties as a result of inhibiting leukotriene production; helps stabilize mast cells; and is a mild iron chelator. It may also inhibit lipid peroxidation with butyrophenones and phenothiazines and may antagonize other herbs such as yohimbine and phentolamine. Side effects are rare but include severe sweating, headache, irritability, allergic reaction, abdominal cramping, nausea, vomiting, weakness, and diarrhea.[32] Loose stools are dosage dependent and are secondary to choleretic activity with increased bile flow. This may potentiate volume depletion in the perioperative patient and thus caution is advised. Until further studies are conducted, suggested time of discontinuation before surgery is 2 to 3 weeks according to American Society of Anesthesiologists guidelines.[10]

Ginseng (*Panax ginseng*)

Ginseng has been used for its ability to protect the body from stress and restore homeostasis. The herb has been labeled adaptogenic, augmenting adrenal steroidogenesis by means of a centrally mediated mechanism and causing a ginseng-induced hypoglycemia. This hypoglycemic effect has been attributed to the constituent ginsenoside Rb2 and panaxans I, J, K, and L. A possible therapeutic use is lowering postprandial blood glucose in patients with type 2 diabetes mellitus. In people without diabetes, this effect may create unintended hypoglycemia, especially in patients who have fasted before surgery. Side effects include insomnia, headache, vomiting, epistaxis, Stevens-Johnson syndrome, postmenopausal vaginal bleeding, mastalgia, diffuse breast nodularity, and hypertension.[9,21,33–35] Because ginseng can cause hypertension, attention should focus on perioperative hemodynamic variation, as these patients are often volume depleted, and anesthetic agents can cause generalized vasodilation. An additional perioperative concern for ginseng involves its effect on coagulation pathways. It has been reported to interact with warfarin with clinical coagulation modulation, suggesting an antiplatelet effect. Because platelet inhibition caused by ginseng may be irreversible,[36] it is recommended that patients discontinue ginseng use at least 7 days before surgery.[17]

Kava (*Piper methysticum rhizoma*)

Kava is popular for its sedative and anxiolytic properties.[17] Kava lactones are the active compounds contained in the herb. They act by potentiating gamma-aminobutyric acid inhibitory neurotransmission. This correlated with an increased barbiturate-induced sleep time in laboratory animals and may explain the mechanism underlying the report of a case of coma attributed to an alprazolam-kava interaction.[37] Thus, surgical caution must be advised because of the increased effects of barbiturates and benzodiazepines causing excessive sedation when used with kava.[17] Furthermore, with long-term use, kava may lead to abuse (addiction, tolerance, and withdrawal) and kava dermopathy (reversible, scaly cutaneous eruptions) and was even withdrawn in Canada for causing fulminant hepatitis.[38] Thus, because of kava's half-life, recommended time of discontinuation before surgery is at least 24 hours.[17]

Garlic (*Allium sativum*)

Garlic is known to aid in the reduction of atherosclerosis and hypercholesterolemia.[17] It is also taken as an antioxidant, an antibiotic, a diuretic, an antitussive, to remove "evil" spirits, strengthen the stomach and spleen, and relieve diarrhea.[39] The active ingredient is allicin, which has been reported to inhibit platelet aggregation. There is a case of spontaneous spinal/epidural hematoma in an 87-year-old man, with associated platelet dysfunction related to excessive garlic ingestion.[40] Therefore, garlic should not be taken with other coagulation inhibitors (e.g., warfarin, heparin, nonsteroidal anti-inflammatory inhibitors, and aspirin). Other side effects include halitosis, nausea, hypotension, headache, bloating, and possible allergic reaction.[23,41,42] It is suggested that garlic be discontinued at least 1 week before surgery.[17]

Additional Remedies with Perioperative Concerns

Saw Palmetto (*Serenoa repens* or *Sabal serrulata*)

Saw palmetto has been advocated for the symptomatic treatment of mild to moderate benign prostatic hyperplasia (Table 2). Side effects are typically mild and include gastrointestinal symptoms (nausea, vomiting, diarrhea), rhinitis,

and headache.[21] Of interest is the fact that in the perioperative period intraoperative hemorrhage has been associated with saw palmetto.[43] Thus, discontinuation is advised at 2 to 3 weeks before surgery.[10]

St. John's Wort (*Hypercum perforatum*)

An herb typically used to treat depression and anxiety, St. John's wort is also used for aches and pains, asthma, and sleep-related disorders.[17,44] Extracts from this herb inhibit isoforms of monoamine oxidase in vitro. Thus, concomitant use with selective serotonin reuptake inhibitors may cause serotonergic syndrome.[45,46] Associated side effects may include dry mouth, dizziness, fatigue, constipation, nausea, gastrointestinal upset, swelling and, rarely, photosensitization.[17,47,48] Photosensitization has been reported most prevalently for those undergoing ultraviolet A or laser treatment.[49–51] Surgeons should be cautioned that long-term use of the herb has been associated with cardiovascular collapse on induction of anesthesia. The herb may also prolong postoperative sedation.[52] It is recommended that the herb be discontinued at least 5 days before surgery to avoid these complications.[17]

Valerian (*Valeriana officinalis*)

Typically used as a relaxant and anxiolytic, valerian is known to be taken as a sedative and is found in almost all sleeping aids.[17] Valerian has been shown to increase activity at gamma-aminobutyric acid receptors and to be an inhibitor of cytochrome P450 3A4. As such, it should not be taken in conjunction with anesthetics, because it may cause excessive sedation.[17] Other side effects may include gastric distress, blurred vision, excitability, restlessness, acute hepatitis, possible tremor, headache, and cardiac disturbances, and long-term use is associated with withdrawal.[21,53,54] For these reasons, it is suggested that use of the herb be discontinued 1 week before surgery.[8]

Ginger (*Zingiber officinale*)

Ginger has been used as a digestive aid, stimulant, diuretic, and antiemetic.[55] Reported effects include potent inhibition of thromboxane synthetase enzyme, leading to prolongation of bleeding time. Thus, use of ginger should be avoided in the perioperative period and should not be combined with other anticoagulants (e.g., warfarin and heparin, or drugs such as nonsteroidal anti-inflammatory inhibitors and aspirin). Other side effects include heartburn or stomach distress, diarrhea, and burning or tingling of the mouth. Thus, to avoid perioperative risk of bleeding and other complications, it is recommended that usage be discontinued 2 to 3 weeks before surgery, according to American Society of Anesthesiologists guidelines.[10]

Eicosapentaenoic Acid (fish oil)

Eicosapentaenoic acid is rapidly growing in popularity and is commonly taken to reduce the incidence of thrombotic cardiovascular disease.[56,57] Its mechanism of action is believed to be by means of inhibition of adenosine diphosphate–induced platelet aggregation. Thus, to avoid perioperative risk of bleeding, it is prudent that usage be discontinued 2 to 3 weeks before surgery, according to American Society of Anesthesiologists guidelines.[12]

Vitamin E

The average American adult has stores of vitamin E to last for 4 years. Supplementation beyond stores has been used for its antioxidant effects and potential to slow progression of atherosclerosis. Reported effects have been population dependent. For patients with normal platelets taking vitamin E, platelet aggregation remains unaffected, but platelet adherence is inhibited, whereas with patients who have abnormal platelets, such as diabetics, both aggregation and adhesion are inhibited. Furthermore, vitamin E has also been shown to be inhibitory to collagen synthesis and thus wound healing.[57,58] As such, the following perioperative recommendations are made. For patients with normal platelets or those undergoing tendon repairs, vitamin E should be discontinued before surgery and withheld until after the healing phase is complete. Patients with abnormal platelets such as diabetics may benefit from stopping vitamin E before surgery, but resuming it afterward may be beneficial to avoid increased platelet aggregation. This latter decision should consider this need with the need for a strong collagen-mediated wound closure.[59] Finally, patients requiring other antiplatelet agents should not take vitamin E. Discontinuation at 2 to 3 weeks before surgery is recommended according to American Society of Anesthesiologists guidelines.[12]

CONCLUSIONS

Herbal medicines and supplements displayed greater prevalence in the cosmetic surgery population than in the population at large. As such, it is of great import for the cosmetic surgeon to understand these remedies and treat them as pharmaceuticals rather than as safe and

natural. The side effects and potential complications warrant such caution.

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