

Lesson S10: PreAnesthetic Assessment of the Patient Using Herbal Therapies – Part 1

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A COURSE OF STUDY FOR AMA/PRA CATEGORY 1 CREDIT

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TIME TO COMPLETE ACTIVITY: 2 hours

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TARGET AUDIENCE: Anesthesiologists

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Needs statement

Herbal, supplemental and alternative therapies can have negative effects in presurgical patients. Patients are most likely to consider herbs to be “safe” and “natural” and infrequently view herbs as harmful drugs. The Food and Drug Administration (FDA) does not regulate herbal preparations in the same strict manner as pharmaceuticals and there is no control on the amount of active ingredients in most of these preparations. Anesthesiologists must be aware that drug interactions can occur, especially during the perioperative period. Physicians need to be equipped with the knowledge of potential problems so that patients may be appropriately advised.

This two part series will review the impact of herb therapy on the surgical population. Complications and drug interactions associated with specific herb therapies are addressed. A short historical outline as well as government regulations and special advisories are presented.

Learning Objectives

At the end of this activity, the participant should be able to:

1. Differentiate between drugs and herbs.
2. Be aware of government regulations regarding herb preparation and labeling.
3. List the most commonly used herbs.
4. Define “herbal”.
5. Be conversant with a short history of herbal medicine.
6. Outline the epidemiology and prevalence of herb use in the United States.
7. Describe an herbal salt substitute.
8. List reasons for the herbal renaissance.
9. Cite the annual expenditure on herb preparations in the United States.
10. Identify sources of information regarding herbal treatments.

Case History

During a preoperative evaluation, a 76-year-old Asian female for total hip replacement revealed that she was regularly ingesting a variety of herbs to treat depression and to season food. She possessed several capsules of Kava kava and St John’s Wort. She reported the use of ginger, ginko and ginseng daily. The patient stated that her surgeon and primary care physician were not informed about her regular use of these herbal substances as she did not regard them as medicine. Physical examination showed a mildly obese female weighing 90 kg with poor dentition and recent episodes of gingival bleeding. Preoperative laboratory tests showed a hemoglobin of 9.0 gm/dl. A bleeding time was found to be abnormal at 16 minutes. Both PT and PTT were elevated.

Introduction

“Herbal” was the title of a book which contained the names of plants and descriptions of their properties. It derives from the Medieval Latin *herbalis* (herb) and *liber* (book). The book contained elements of plant lore, information about the medicinal properties of herbs, and many illustrations to assist in identification. Sometimes mineral and animal medicaments and non-medicinal plant uses (e.g., cosmetics) were included.

Books entitled “Herbal” were printed in Western Europe from 1470 - 1670. Historical accounts of herb usage often refer to scrolls, written manuscripts and incunabula (books compiled before 1501). Accounts from Chinese, Indian, Greek and Mesopotamian traditions were often found. Throughout all cultures, those who possessed a working knowledge of the toxic, hallucinatory, aromatic, culinary and healing powers of plants and herbs occupied prestigious societal positions. They were commonly called medicine men, apothecaries, physicians or shaman. For the most part, the use of ancient herbs as treatment of disease has been replaced by the products of modern chemistry, toxicology and pharmacology. However, herbs and their extracts remain a major part of complementary medicine today.

Even patients who seek conventional health care will commonly use herbs and related products. All physicians, regardless of specialty, care for patients who use products that are neither prescribed nor recommended. Tens of thousands of herbal and related products are presently available in the United States. All physicians should be familiar with the potential benefits and hazards of the most commonly used herbal products. As many as 70% of patients do not reveal their use of “neutraceuticals” or natural supplements prompting many hospitals to incorporate specific queries in patient questionnaires.¹ Patients must be encouraged to reveal all “over the counter” agents especially those that they may have recently consumed. In emergency or trauma care, this may pose a considerable challenge for healthcare professionals and may lead to unexpected complications perioperatively.

Definition and Use of Herbs

Herbs are derived from flowers, shrubs, trees, algae, ferns, fungi, seaweeds and grasses. They are frequently used to treat diseases and improve the quality of life. By definition, herbs are drugs. The word “drug” is derived from an ancient word for “root”. Herbal use is not always safe despite the strong association with nature. And ingestion can even result in death.

All parts of the plant are used. Some herbs are most potent when used fresh, and other can be dried or preserved in alcohol (tinctures), steeped as teas (infusions), simmered (decoctions), extracted by vinegar (acettracts), syrups, vegetable glycerin or honey. Freeze dried herbal powders are made into tablets, capsules, pastes or concentrates that are 4 - 6 times regular strength. Herbs may also be given as suppositories, creams, liniments, oils (aromatherapy) or baths. Difference in potency comes from species differences among the roots, plants or fruits, growing conditions and the methods used to extract active ingredients.

The ever-growing interest in herbal therapy in the United States is related to several factors. Western medicines may not always produce a positive outcome or may produce undesirable side effects. Herbal therapies are considered a less expensive alternative to prescription drugs, are touted as “safe and effective” and are readily available over the counter. Greater numbers of people are traveling and becoming exposed to cultures with strong traditions in herbal therapy. For example, Asian remedies such as ginseng, ma huang, green tea and others are now integrated into many diets in the United States. There is greater consciousness about limiting dietary portions of meat and increasing fiber intake and this has resulted in an increased consumption of leafy vegetables and leafy herbs. Recommendations by the American Heart Association to decrease salt intake has resulted in greater use of flavor substitutes consisting of herbs to make food more palatable. Herbs may have significant quantities of antioxidants such as vitamin A and C and some have been scientifically validated as beneficial.

Greater than 50% of adults who are treated at hospitals in the United States use herbal medicines, multivitamins, or both, along with prescription drugs.² Annual expenditures on herbal therapies exceed 10 billion dollars. Self-prescribed formulations have unique pharmacodynamics and pharmacokinetics that can require adjunctive treatment for unexpected drug-induced responses perioperatively.

More than 50% of adult Americans have used at least one alternative therapy in recent years. Relaxation techniques and herbs have been advocated to treat chronic medical conditions such as diabetes, cancer, arthritis or AIDS. Insurance plans and managed care organizations may offer reimbursement for alternative treatments. For example, coverage of chiropractic treatment is

mandated by law in at least 45 states, acupuncture in 7 states and naturopathy in 2 states.^{3,4} Insurance plans that cover alternative health care often require physician referral for these services, highlighting the importance of physician awareness for less conventional therapies.

Problematic for physicians is that the majority of patients who take herbal preparations do not tell their doctors of this practice believing it to be “safe” and “natural”. One study of 3842 patients in Boston indicated that 22% used herbal remedies and 51% took vitamins. Women and patients aged 40-60 were most likely to use herbs.⁵ Use of complementary and alternative medicine by American adults increased from 34% in 1990 to 42% in 1997. Results from a California study of 2560 patients showed that 39% used alternative medicines, 44% had not sought medical advice and 56% did not inform the anesthesiologist before surgery.⁶ Caucasian women with higher education were more likely to take herbal remedies.

History of Herbal Medicine

Herbal medicine is an integral part of the history of modern medicine. Many conventional medications were originally derived from plants. Some herbs are of historic importance.⁷ White willow bark and meadowsweet plant are the basis for salicylic acid, a precursor of aspirin; foxglove plant is the basis for digitalis; cinchona bark is the precursor to quinine compounds; and periwinkle provides the chemotherapeutic agent, vincristine. The most widely used narcotic, morphine, is derived from the opium poppy. In recent years, there have been many other therapeutic agents derived from herbs.

The Middle East has a rich history of herbal medicine. Texts preserved from the ancient cultures of Greece, Egypt, India and Mesopotamia describe and illustrate the use of therapeutic plant products, including castor oil, linseed oil and white poppies. In the Old Testament, the book of Ezekiel (which dates from the 6th century B.C.) contains the following clause indicating the utility of plants: “... *and the fruit thereof shall be for meat, and leaf thereof for medicine.*” Egyptian hieroglyphs portray physicians of the first and second centuries A.D., treating constipation with sienna pods, and treating other digestive abnormalities with caraway and peppermint. The medical papyri reveal substantial use of hyoscyamus, scopolamine, and opium poppy along with ritual and medical procedures. An extensive Egyptian pharmacopoeia later influenced the Greek, Roman, Hebrew and Arabic practice of medicine. There is evidence that the use of plants as medicine predates recorded history. Marshmallow root, hyacinth and yarrow were discovered around the bones of a stone-age man in Iraq. Ancient Indian civilizations had a well-defined practice of herbal medicine called the Ayurvedic system. Vedic scriptural texts contain a book known as the Ayurveda that prescribes treatments of diseases with herbs, a practice that is still prevalent in the Indian subcontinent.

The Chinese traditional system of medicine was developed by individual scholars and government institutions in ancient times. Medical practice was based on the work of Emperor Shen Nung (2800 B.C.), a highly regarded authority on the medical use of herbs, and Huang Ti (2600 B.C.), the credited originator of the medical classic called Nei Ching. Shortly thereafter, the Chinese published the first book of materia medica which was periodically revised and expanded.

The records of King Hammurabi of Babylon (c.1800 B.C.) include instructions for using medicinal plants. Hammurabi prescribed the use of mint for digestive disorders. Paulus Aegineta, a preeminent Greek master during the 7th century A.D., provided significant insight into ancient materia medica. In seven books, he presented a complete account of the knowledge possessed by the Greeks, Romans and

Arabs on all subjects connected with medicine and surgery. This opus was translated into English by Francis Adams in the 19th century for the Sydenham Society in London.⁸ The seventh book contains an account of all medicines, simple and compound. Paulus Aeginata compiled the prescriptions of Hippocrates, Dioscorides (de materia medica) Celsius, Scribonius, Marcellus Empiricus, Plinay, Rei Rusticae, Scriptoros, Apuleuis (de herbis), Antonius Musa (de herba botanica), Macer, Floridus, Galenus, Aetius, Oribasius, Avicenna, Ebn Baithar, and others. Dioscorides listed 90 minerals, 700 plants and 168 animal substances for a total of 958 therapeutic preparations and was regarded as the earliest and greatest authority on material medica. The Arabs added a number of plant substances such as camphor, sienna, musk, nux vomica and tamarinds to the Greek materia medica. Ebn Baithar, one of the most prolific Arab therapists, published 1400 medical and dietary articles. In his commentary of this compilation by Paulus Aegineta, Francis Adams noted that the Greek, Roman and Arab physicians were amply provided with medicines of every possible character and he concluded that there is no reason to suppose that the latter were in anyway behind the physicians of the 19th century. Indeed the indications, effects and even drug interactions were well known and documented with few additions and changes over 1500 years.

Throughout the middle ages, homegrown botanicals were the only medicines readily available, and for centuries, most households possessed a carefully tended and extensively used herb garden. For the most part, herbal healing lore was passed from generation to generation by word of mouth. A father taught his son, the village herbal practitioner taught his most promising apprentice. By the 17th century, the knowledge of herbal medicine was widely disseminated throughout Europe. In 1649, Nicholas Culpeper wrote a physical directory and, a few years later, produced *The English Physician*, a widely acclaimed herbal pharmacopoeia designed to be a layperson's manual for health care. Culpeper studied medicine at Cambridge University. He also served as an apprentice to an apothecary. He later opened a shop serving the poor of London and became regarded as their "neighborhood doctor".

The discovery of the diuretic effect of foxglove in the late 18th century was one of the most interesting additions to the world's pharmacopoeia. In a "family recipe", the herb was mixed with other ingredients and prescribed for treatment by an old woman in Shropshire, England. In 1775, Dr. William Withering, a physician at the General Hospital at Birmingham, identified digitalis as the active ingredient in foxglove. He used the herb widely to treat the sick poor at the hospital. He published a review of the effects of the therapy in 163 cases, described successes and failures, and included case reports from other practitioners who dispensed the treatment. He concluded that poor outcome was due to improper indications or overdose.

In the United States, the first pharmacopoeia was published in 1820. This volume included an authoritative listing of the herbal drugs, with description of their properties, uses, dosages and tests of purity. It was periodically revised and became the legal standard for medical compounds by the turn of the century.

"Handbook of Medicinal Herbs",⁹ a comprehensive textbook authored by James Duke, PhD, was published in 1985. Based on the author's concept of "an herb a day", the book describes 365 folk medicinal species. Dr. Duke notes that there are indications of an herbal "renaissance" or rebirth and cautions that mixed outcomes are likely as the use of herbal substances increases. Public education and physician awareness are necessary to assure safety.

Drugs from Herbs

With scientific advancement of methods to extract and synthesize the active ingredients from medicinal plants, pharmaceutical laboratories enabled the transformation of medicinal herbs into modern drugs.¹⁰ More than 30% of all modern conventional medicines are derived from plants.¹⁰ Drugs derived from plants that are used in the perioperative period are listed in Table 1.

Table -1: Drugs derived from plants

Plant	Drug
Atropa Belladonna	Atropine
Digitalis Purpura	Digitalis
Papaver somniferum	Codeine
Cephaelis ipecacuanha	Ipecac
Physostigma venunosum	Physostigmine
Ephedra sinica	Ephedrine
Erythroxyton coca	Cocaine
Datura fastuosa	Scopolamine
Willow	Aspirin

Government Regulations

There are inconsistencies in the manufacture, promotion of health benefits, potency and purity of herbal preparations. Herbal therapies do not require adherence to the standards and regulations that the FDA enforces for the pharmaceutical industry. Phased trials are not required and simple herbs are not generally patented (although some herb combinations have been patented).

The Dietary Supplement Health and Education Act of 1994 requires the manufacturer to assure product safety. The role of the FDA is to gather proof to determine that a product is unsafe. Thus, the FDA can only remove a preparation from the market if it is suspected of being unsafe. As such, most herbal products do not undergo any evaluation by the FDA before they are available to the general public.

Amid growing concerns about safety and health claim practices, the FDA issued in April, 1998, "Regulations on Statements Made for Dietary Supplements Concerning the Effects of the Product on the Structure of Function of the Body." These regulations state that any dietary supplements that "expressly or implicitly claim to diagnose, treat, prevent or cure a disease" meet the safety and effectiveness standards for pharmaceutical drugs as regulated by the FDA under the Federal Food, Drug and Cosmetics Act.¹¹ For the purpose of regulation, disease is defined as "any deviation from, impairment of, or interruption of the normal structure or function of any part, organ or system that is manifested by a characteristic set of one or more signs or symptoms..." This definition permits a claim that an herbal product "promotes vascular health" but does not permit a claim that the product "decreases blood pressure." Herbal products labels must contain a statement that the product "is not intended to diagnose, treat, cure or prevent any disease" and thus is not subject to the FDA drug regulations. For those supplements and preparations that claim outcomes such as weight loss, the manufacturer must also add "this statement has not been evaluated by the Food and Drug Administration".

To address the complications of drug interactions with herbs, the American Society of Anesthesiologists (ASA) provides information to practitioners in the form of a pamphlet entitled “Considerations for Anesthesiologists: What you should know about your patients’ use of Herbal Medicines”.¹² Similarly, the New York State Society of Anesthesiologists issued a warning in a newsletter published in 1999.¹³

Adverse Perioperative Events

A recent cohort study of 600 patients in Hong Kong presenting for surgery indicated that 80% used self prescribed herbal preparations, mostly herbal soups, teas, ginger, ginseng and multi component packages.¹⁴ Some of these preparations contained as many as 37 herbs, many of which had diuretic effects resulting in preoperative hypokalemia, dysrhythmias and hypotension. Interference with coagulation was also identified and hospital stay was noted to be prolonged, especially in patients taking herbal preparations prescribed by a traditional Chinese medical practitioner. The authors estimated that 130 adverse events per year out of a total number of 10,000 surgeries could be prevented by stopping the use of herbs prior to surgery. The development of both patient and health care worker education was emphasized.

Another report, surveyed the initial results of a multidisciplinary approach to the toxicology problems associated with the use of herbs.¹⁵ Several cases of acute renal failure were attributed to improper dispensing practice whereby the toxic herb was not listed in the prescription. These findings point again to the complex nature of problems associated with herbal ingestion. Complications that occur cannot be appropriately treated because a cause cannot be readily identified (e.g. cases of tetrahydropalmitine, anticholinergic or aconitine poisoning). Recent reports describe issues with ingestion of herbs for glycemic control.¹⁶ Such herbs typically contain chlorpropamide, a potent antiglycemic agent, that can have unpredictable, potentially life-threatening effects when consumed in unknown concentrations.

California residents use significantly greater amounts of herbal dietary supplements than residents of other states. A recent survey of patients undergoing cosmetic surgery in California revealed a 55% prevalence of herbal use in that group, as compared to 24% prevalence in the population at large.¹⁷ Treatment of side effects and complications from herbal medicine require management similar to that of similar effects produced by pharmaceuticals. The preparations identified most frequently included chondroitin, ephedra, echinacea, glucosamine, ginger and ginseng. In 85% of cases, despite physician awareness, no recommendation to discontinue ingestion of herbal medicine was made. Ephedra was the only herbal medicine that was unanimously discontinued pre-operatively by physicians, likely indicating the effectiveness of media coverage.

Oral surgeons and dermatologists have also been advised of the potential complications they are likely to encounter as a result of herbal medicines, especially in older adults.^{18,19} The majority of findings are from case reports. Nevertheless, it is important to perform a careful history of medication and dietary supplement usage and formulate appropriate treatment plans.

Similar warnings have been issued to obstetricians. Women should be advised to refrain from exposing their fetuses (either during pregnancy or while breast feeding) to the risks of herbs, including green tea, which may contain almost as much caffeine (80mg) as regular coffee (about 100mg) and ginger, which has been widely used to treat morning sickness.²⁰ The Teratology Society, dedicated to the

prevention of birth defects, has stated that it should not be assumed that natural or herbal supplements are safe for the embryo or fetus.

Commonly used Herbs

There are more than 12,000 identified herbs, resulting in many thousand combination preparations available as over-the-counter therapeutic agents in the United States. The most popular are:

- Echinacea (*Echinacea purpurea*, *Echinacea pallida* and *angustifolia*)
- garlic
- goldenseal (*Hydrastis canadensis*)
- ginseng (Asian *Panax ginseng* and American *Panax quinquefolius*)
- ginkgo (*Ginkgo biloba*)
- saw palmetto (*Serenoa repens*)
- aloe (*Aloe* species)
- ma huang (*Ephedra sinica*)
- siberian ginseng (*Eleutherococcus senticosus*)
- cranberry (*Vaccinium macrocarpon*)
- St. John's wort (*Hypericum perforatum*)
- valerian (*Valeriana officinalis*)
- feverfew (*Tanacetum parthenium*)

Many dietary supplements which incorporate vitamins, herbs, fruit extracts and mineral compounds are readily available and widely consumed.³

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Post-test

1. Patients who seek conventional health care:

- a. Never use herbal medications
- b. Are less likely to use herbal medications
- c. Commonly use herbal medications
- d. Have a greater awareness of drug interactions

2. Regarding herbal products:

- a. Tens of thousands are available over the counter in the United States
- b. The industry is well regulated by the FDA
- c. Combinations of products are not very common
- d. All of the above

3. The least likely reason for the recent Herbal Renaissance is:

- a. Safety
- b. Herbs often work
- c. Decreased meat diets are recommended
- d. Increased awareness and exposure to other cultures

4. Herbs are derived from:

- a. Fungi
- b. Seaweed
- c. Algae
- d. All of the above

5. Studies show that patients in the U.S. who take herbal preparations are most likely to:

- a. Report the information to their physician
- b. Believe that it is safe and not inform their physician
- c. Be Asian men
- d. “b” and “c”

6. Paulus Aegineta:

- a. Consolidated the medical knowledge of the ancient Greeks, Romans and Arabians into a 7 volume compendium
- b. Gave a description of herbs and their uses that has changed little for 1500 years
- c. Lived in the 7th century
- d. All of the above

7. Foxglove:

- a. Contains digitalis
- b. Was used for treatment by William Withering in 1785
- c. Proved to be successful for all illnesses common in the 18th century
- d. "a" and "b"

8. Studies have indicated that which of the following may occur in the perioperative period in patients who use herbs:

- a. Improved glycemic control
- b. Improved recovery from anesthesia
- c. Hypokalemia, dysrhythmias and hypotension
- d. Increased renal perfusion

9. The Dietary Supplement Health and Education Act:

- a. Ensures governmental supervision of all herbal preparations
- b. Requires that manufacturers of herbal medicines perform tiered clinical trials
- c. Places the burden of product safety assurance on the manufacturer
- d. Requires nothing of the FDA

10. Obstetricians are advised to discourage herb usage by pregnant patients or nursing mothers because:

- a. Herbal substances cannot be assumed to be safe for fetuses
- b. Teas may contain more caffeine than regular coffee
- c. Newborns can ingest botanical chemicals in breast milk
- d. All of the above