

HERBAL MEDICINE IN ANESTHESIA

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Objectives

- Identify the top nine herbal hazards in anesthesia
- Review the history of herbal medicine
- Discuss herbal mechanism of actions and side effects
- Discuss herbal interactions with anesthetics and drugs used in surgery
- Raise awareness for anesthesia providers regarding herbal usage among surgical patients

Case Scenario

- Ms. Johnson in pre-op holding waiting for surgery
- CRNA and Ms. Johnson meet for the first time
- CRNA develops best plan of anesthesia for Ms. Johnson



Case Scenario

- Surgeon discusses Ms. Johnson's case with colleague
- CRNA overhears surgeons discussion
- Ms. Johnson disclosed to surgeon improvement of health with recent new herbal consumption



Case Scenario

- CRNA returns to clarify all medications Ms. Johnson was taking, including herbals
- CRNA educated Ms. Johnson on importance of disclosing all medications
- The anesthetic plan was changed



Introduction

- According to the National Institute of Health's Office of Dietary Supplements:
 - Herbs are products made from botanicals that are used to maintain or improve health
- Herbal supplements have been used for centuries, and their use in western societies is increasing with alarming frequency



National Institutes of Health
Office of Dietary Supplements

History of Herbs

- Herbal medicine and modern medicine are indisputably intertwined
- Many drugs today were derived from plants

Plant	Drug
White willow bark & meadowsweet	Aspirin
Foxglove	Digitalis
Atropa Belladonna	Atropine
Periwinkle	Vincristine
Ephedra sinica	Ephedrine
Datura fastuosa	Scopolamine
Opium poppy	Morphine

History of Herbal Medicine

- Ancient Egypt, Greece, India, and Mesopotamia text with herbal utilization have been found
- Egyptian physicians of the 1st and 2nd century B.C. used herbals to treat constipation and digestive disorders
- The book of Ezekiel is the oldest record of herbal medicine:
 - “the fruit shall be for meat, and the *leaf* there of for medicine”

History of Herbal Medicine

- Paulus Aegineta, Greek physician in the 6th-7th century, gave the greatest insight into the ancient world concerning herbal medicine
- Compiled all medical knowledge from Greeks, Romans, and Arabians into 7 books
- Translated by Francis Adams in the 19th century



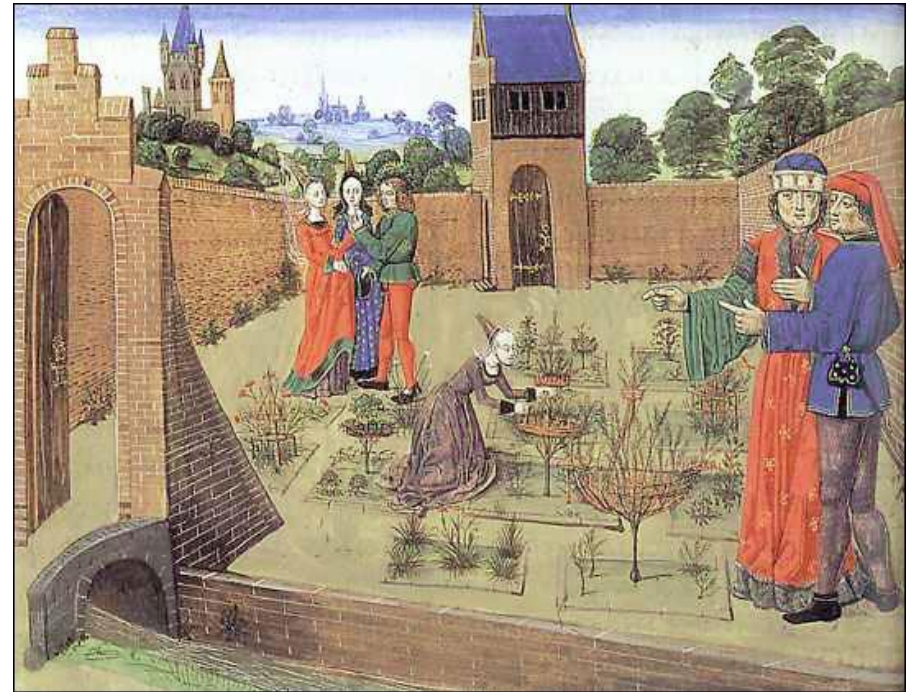
History of Herbal Medicine

- Francis Adams – noted that early century physicians were in no way behind physicians of the 19th century
- Only minor changes occurred over 1500 years regarding the indications, effects, and drug interactions prehistoric physicians had documented



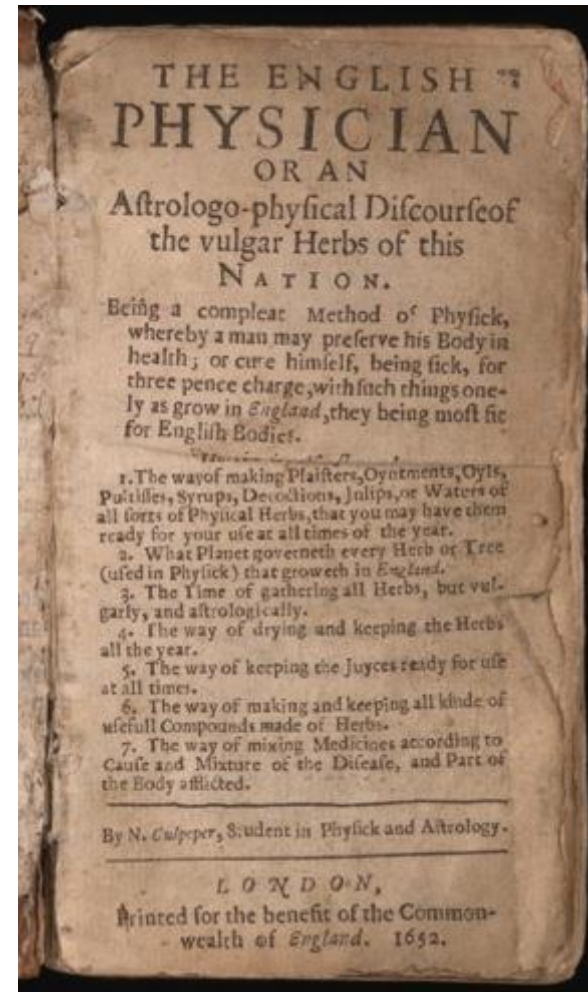
History of Herbal Medicine

- Home grown botanicals were the only medicines available during the Middle Ages
- Herbal healing lore passed down by word of mouth throughout generations



History of Herbal Medicine

- Physician Nicholas Culpeper wrote the first available manual a layperson could use for healthcare by the 17th century
- Manual was titled The English Physician



History of Herbal Medicine

- In 1820 the first U.S. Pharmacopeia was published
- It was an authoritative listing of herbal drugs
- Became the legal standard for medical compounds
- Guide to Natural Medicinal Therapies, published by the Physicians Desk Reference, is distributed to all doctors and updated annually

Trends of Herbal Usage

- From 1990-1997, the use of herbal supplements **increased** 380% in the United States (Eisenberg et al., 1998)
- More than 15 million adults reported combining herbal supplements with prescription medication



Trends of Herbal Usage

- Several reasons for the increasing interest in herbal supplements may be because:
 1. The use of Western medicines may not always deliver good results
 2. The increase in travel and exposure to other cultures has revived many traditions and exotic therapies
 3. The rising cost of health care may force patients to seek less expensive therapies



Co-administration of Herbs

- Herbal products have intrinsic pharmacological activity and side effects that when combined with medications can have severe adverse effects
- Ruiz & Maldonado (2014) found that one out of every six patients take some type of dietary supplement together with prescribed medications
- 70% of those taking herbal supplements fail to tell their physicians

Government Regulation

- Herbal products are a unique class of dietary supplements because they are derived from medicinal plants but not regulated in the US
- The Food and Drug Administration (FDA) does not hold herbal remedies to the same standards and regulations as the pharmaceutical industry



Government Regulation

Dietary Supplement Health and Education Act of 1994

- Exempted dietary supplements including herbal preparations from FDA oversight
- This allowed herbal supplements to be offered publicly without premarketing approval or submission to the FDA

Despite all of this, a study conducted in 2009 by Krajewski et al., showed 84% of consumers trust in the quality, safety, and efficacy claims of these supplements

Recommendations

- Due to the lack of research, the American Society of Anesthesiologists (ASA) has determined that there is insufficient data to provide exact dosage recommendations for individual herbs
- The American Society of Anesthesiologists urges patients to tell their anesthesiologist about any medications they are taking, including all vitamins, herbal supplements and other alternative substances

Recommendations

- ASA recommendations:
 1. Asking the patient to physically bring all substances, including prescription and over-the-counter, the day of surgery
 2. Ask patients to stop taking these supplements two weeks prior surgery

Vulnerable Populations

- Elderly
- Children
- Pregnant
- Immune compromised

Review of Literature

- We look to peer reviewed journal articles to answer some of the most common questions regarding herbals
 - What is the most current body of knowledge regarding herbals in practice?
 - Who is at risk?
 - In what medical settings are herbals dangerous?
 - What are patients taking?
 - What herbs are the most common?
 - Who knows about herbal usage and why or why not?

Use of Herbal Products and Potential Interactions in Patients With Cardiovascular Diseases

- Tachjian et. al (2010)
- Highlights a vulnerable population to watch over because of their concurrent use of herbals and prescription medication
 - “The use of herbal supplements is prevalent among patients who are taking prescription medications, particularly senior citizens”
- Elderly are among the highest population that undergo cardiac surgery
- Discusses the shift from primary care to alternative care
 - “...the total number of visits to complementary and alternative medicine providers far exceeds those to primary physicians”

Perioperative risks and benefits of herbal supplements in aesthetic surgery

- Rowe, D. J., & Baker, A. C. (2009)
- Disconnect in reporting
 - 40-70% of patients do not tell their primary care physicians about supplement consumption
 - 90% of patients DO tell their naturopathic physician of their prescription medication
- Need for physicians, surgeons and anesthesia providers to become familiar with herbals and their interactions
 - Recommends that these professionals should ask patients about herbal use
 - Anesthesia providers specifically, should be aware of adverse interactions with herbals taken by patients

Case reports of adverse effects of herbal medicinal products (HMPs): A quality assessment

- Hung, S. K., Hillier, S., & Ernst, E. (2011)
- Examine the trends of reporting of adverse effects
 - 1986–1988
 - 1996–1998
 - 2006–2008
- Case reporting of herbal adverse reactions is improving

Topical herbal remedies: Research opportunities for plastic surgeons.

- Krajewski, A., Garg, M., & Chandawarkar, R. Y. (2010)
- Some herbals may be helpful in skin healing processes
 - Not regulated for dosages and frequency of herbal use
 - Side effects not clearly identified
- None of the herbals uses on the skin was granted “A” rating → supporting the need for further research
- Little evidence in favor or against topical herbal remedies in plastic surgery anesthesia specifically, let alone in medicine in general

Current Problem

- Literature suggests that herbals may be helpful in treating a plethora of ailments, possibly more effectively and less costly than pharmaceuticals
- Many consumers believe that herbal medicines are natural and therefore safe, but this is a dangerous assumption
- Approximately 38 million adults in the US (18.9% of the population) use herbs or other natural substance

Current Problem

- Ang-Lee et al. found that herbal interactions with anesthesia are **not** well known among providers
- Survey conducted in 2005 and published by AANA found:
 1. Only 23% of CRNAs were familiar with the ASA recommendation to discontinue herbal medicine 2 weeks before surgery
 2. 80% stated preoperative forms did not have space to document herbal supplement usage
 3. 93% wanted more educational opportunities on anesthesia and herbal supplements

Top nine herbal hazards in anesthesia

1. Echinacea
2. Ephedra
3. Garlic
4. Ginkgo biloba
5. Ginseng
6. Kava
7. Saw palmetto
8. St. John's wort
9. Valerian

Echinacea

Echinacea

- Member of the daisy family which can be found throughout the North American plains, prairies, and woodlands
- There are nine species of Echinacea, but medicinal properties are primarily derived from three
 1. *Echinacea pallida*
 2. *Echinacea purpurea*
 3. *Echinacea angustifolia*



Echinacea

- Used to prevent and treat bacterial, viral, and fungal infections
- Improves immune system by:
 1. Enhanced phagocytosis
 2. Nonspecific T-cell stimulation
 3. Modulating cytokine signaling



Echinacea

- Immunostimulatory effects may offset immunosuppressant properties of corticosteroids or cyclosporine → **contraindicated** in patients with systemic and autoimmune disorders
- Inhibits hepatic enzymes → risk for toxicity in drugs metabolized by liver (phenytoin, rifampin, barbiturates)
- Chronic use can result in hepatic failure

Ephedra

Ephedra

- Used to treat the common cold, bronchitis, fever, asthma, and low blood pressure
- Increases metabolic rate → included in many over-the-counter weight reduction preparations

XVII, 1.

14. Inetaceae.



28. *Ephedra distachya* L.

Meerträubchen.

Ephedra

- Sympathomimetic:
 - Direct stimulation of alpha and beta adrenergic receptors
 - Indirect increase release of norepinephrine from presynaptic neurons
- Long term use may deplete endogenous catecholamines
→ intra-operative cardiovascular instability and tachyphylaxis to other sympathomimetic drugs (Frost, 2006)

Ephedra

- Direct-acting sympathomimetic (phenylephrine) must be used to treat intra-operative hypotension
- Cardiac dysrhythmias can occur when coupled with volatile anesthetics (e.g. halothane) and cardiac glycosides (e.g. digitalis)



Drawing by Mimi Kamp

Garlic

Garlic

- One of the most popular herbal remedies used for centuries for its medicinal properties
- Marketed for its antiplatelet, antioxidant, and antihypertensive effects



Garlic

- Active component, ajoene, inhibits collagen induced platelet aggregation
- Cysteine, found in garlic, decreases thromboxane formation and alters arachidonic acid metabolism
- Has been shown to have significant lowering effects on blood pressure

Garlic

- Adverse effects:

- Nausea
- Hypotension
- Allergy



- Anesthesia provider should be aware of the augmented effects of warfarin, heparin, non-steroidal anti-inflammatory drugs (NSAIDs), and aspirin when taken with Garlic → abnormal bleeding time and increased risk of intraoperative or postoperative bleeding

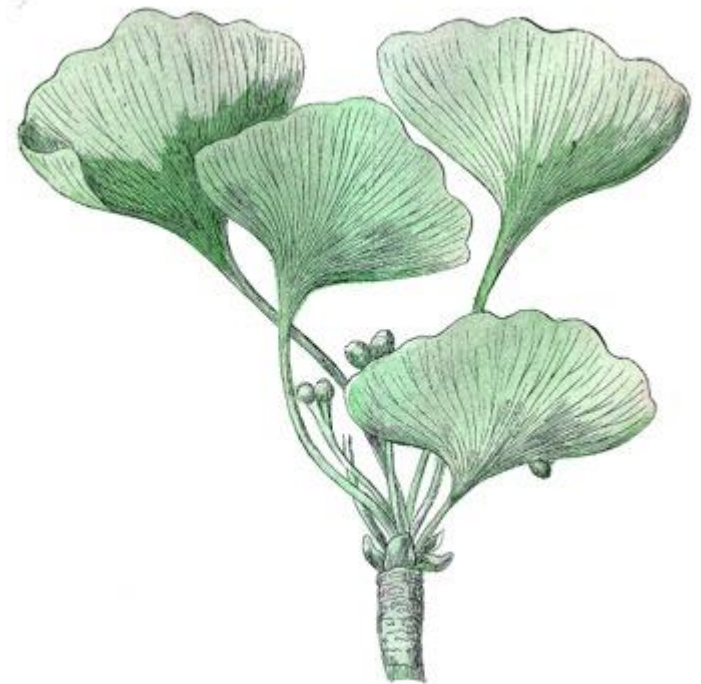
Ginkgo biloba

Ginkgo biloba

- Used medicinally for thousands of years as an:
 - Antioxidant
 - Circulatory stimulant
 - Treatment for intermittent claudication
 - Tinnitus
 - Vertigo
 - Memory enhancement
 - Sexual dysfunction
- Flavonoids, active compounds found in Ginkgo, give it its antioxidant and free radical scavenging ability

Ginkgo biloba

- Many effects on health, particularly in regards to the nervous system and cognitive disorders
- Helpful adjunct in Alzheimer treatments



Ginkgo biloba

- Adverse effects:
 - Mild GI upset
 - Headaches
- Ginkgo inhibits platelet-activating factor (PAF receptor antagonist) → exacerbate blood loss in surgery
- Avoid concomitant use with anticonvulsant → decreases effectiveness of agents
- Avoid taking with tricyclic antidepressants (TCAs) as it might potentiate the seizure threshold lowering actions of these drugs

Ginkgo biloba

- Used in diabetic population to treat peripheral neuropathies
- Synergistic effect with anti-diabetic oral medications → exaggerated effects of hypoglycemia



Ginseng

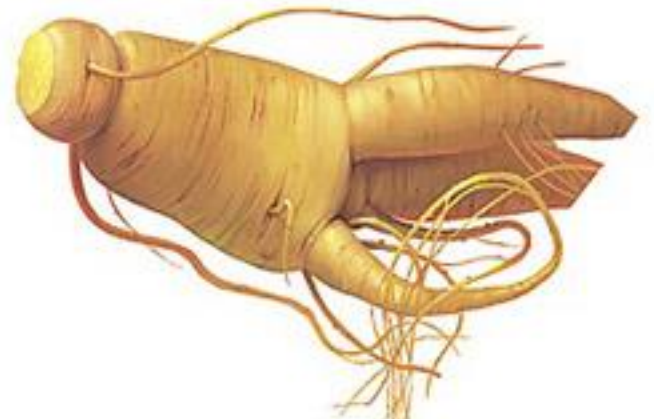
Ginseng

- Used for mood enhancement, immunomodulation, and as an aphrodisiac
- Also has antioxidant and hypoglycemic activity
- Adverse effects include: hypertension, insomnia, headache, vomiting, and epistaxis



Ginseng

- Hypertension is a serious side effect of prolonged Ginseng use
- Monitor patients for s/s of *undiagnosed* hypertension:
 1. End-organ damage
 2. Volume depletion
 3. Autonomic instability



Ginseng

- Perioperative hemodynamics should be vigilantly monitored as anesthetic drugs cause profound vasodilation and many patients are often volume depleted leading to profound hypotension
- Avoid concomitant use of ginseng with Monoamine Oxidase Inhibitors (MAOIs) because manic episodes have been reported



Ginseng

- Avoid use of Ginseng in patients taking warfarin, aspirin, and NSAIDs → increased risk for bleeding peri-operatively
- Blood glucose should be monitored intra-operatively for hypoglycemic episodes in high risk patients
 - Neurosurgical patients receiving steroids
 - Diabetic end-stage renal disease



Kava

Kava



- Kava is derived from the dried root of the pepper plant family
- Used for its anxiolytic and sedative properties
- The active ingredients called kavapyrones, have central muscle-relaxing properties and anticonvulsant activity

Kava

- Potentiates gamma-aminobutyric acid (GABA) neurotransmission, producing an agonistic effect on these receptors
- Other properties include:
 - Analgesic
 - Anesthetic
 - Anti-convulsive
 - Local anesthetic properties



Kava

- Serious side effects include: hepatotoxicity, dermatological changes, hallucinations, and extrapyramidal-like dystonic reactions
- Since it potentiates GABA transmission, the anesthesia provider should be aware of the *additive effects* with anesthetics
- Kava, which has a half-life of nine hours, should be discontinued for at least 24 hours before surgery in order to avoid interactions with anesthesia

Saw palmetto

Saw palmetto

- Used in the aging male population for treatment of benign prostatic hypertrophy
- Shown to inhibit alpha-1 adrenergic receptors
- Inhibits cyclooxygenase, which can help with inflammation but hinder blood clot formation



Saw palmetto

- Steroids and free fatty acids are thought to be the active components of this herb, which in high doses can lead to pancreatitis and cholestatic hepatitis
- Side effects include: headache and GI symptoms
- Although limited research cannot support acute discontinuation of Saw palmetto prior to surgery, caution should still be used because of the potential for pharmacokinetic alterations



St. John's wort

St. John's wort

- One of the top ten herbs used according to the news source, USA Today
- Used to treat depression and anxiety
- Thought to inhibit serotonin, norepinephrine, and dopamine re-uptake



St. John's wort

- Side effects:
 - Photosensitivity
 - Dry mouth
 - Dizziness
 - Fatigue
 - Constipation
 - Nausea
- Photosensitization drugs (e.g., piroxicam and tetracycline) should be *avoided*



St. John's wort

- Potential to cause serotonin syndrome by concurrently taking St. John's wort with other drugs that also increase plasma serotonin concentration
- These drugs include: Selective serotonin reuptake inhibitors (SSRIs) and Monoamine oxidase inhibitors (MAOIs)
- S/S of serotonin syndrome
 - Muscle rigidity
 - Hypertonicity
 - Myoclonus
 - Autonomic dysfunction
 - Hypertension
 - Death



St. John's wort

- A potent inducer of cytochrome P450 3A4 isoform, which is responsible for the metabolism of more than 50% of prescribed medications
 - *Decreasing* plasma concentrations of alfentanil, fentanyl, midazolam, and lidocaine
- Also affects CYP 2C9 isoform, which can reduce the effects of NSAIDs and warfarin
- St. John's Wort may delay emergence by potentiating the effects of anesthetic agents

Valerian

Valerian

- Commercialized for its sedative and anxiolytic properties
- Used for treatment of insomnia
- Many over-the-counter sleep aids contain some form of Valerian



Valerian

- Primary mechanism of action is by *inhibiting* the breakdown and reuptake of the GABA neurotransmitter
- Patients can become physically dependent
- Tapering the dose over several days is recommended because abrupt discontinuation can lead to s/s of withdrawal



Valerian

- Side effects include:

- Tremors
- Headaches
- Hepatic dysfunction
- Cardiac disturbances



- Concomitant use with sedatives and anxiolytics has been strongly discouraged in literature

Summary

- The consumption of herbal supplements in Western societies is increasing
- It is evident from the current literature that there is potential for harm to patients undergoing anesthesia while simultaneously taking herbals
- Many patients taking herbal supplements fail to tell their physician about their consumption
- It is our duty as Certified Registered Nurse Anesthetist to protect the patient from adverse interactions

Conclusion

- As herbal medicine consumption continues to increase, anesthesia providers should become accustomed with their usage and possible intraoperative complications
- Inquiry of herbal/drug interactions *must* be a routine component of preoperative assessment
- Familiarity with common herb mechanisms of action and knowledge of current literature recommendations, demonstrates an ideal anesthetic evidence based practice, which is ideal for our patients

Thank you

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