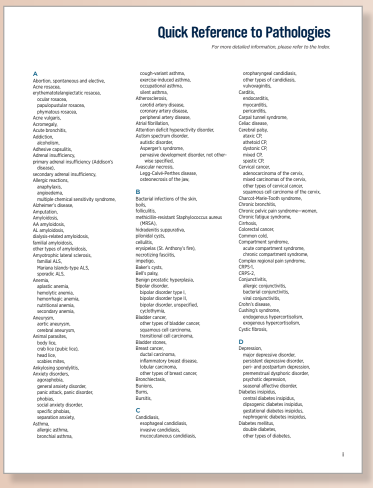
User's Guide

A Massage Therapist's Guide to Pathology provides tools—**both within this textbook and online**—to help you make informed decisions about working with clients who live with a variety of diseases and conditions. This **User's Guide** shows how to put those tools to work for you.

IN THIS TEXTBOOK



Quick Reference to Pathologies

A full list of all the conditions with their subtypes and page numbers can be found in the **Quick Reference to Pathologies** located on the first pages of this book.

In Every Chapter

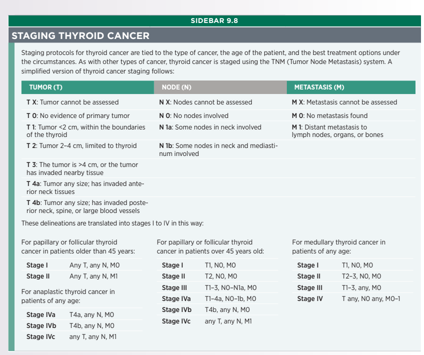
You'll find features specifically designed to promote engagement and interaction with the chapter topics.

Learning Objectives

A list of Learning Objectives appears near the beginning of each chapter to help you prioritize what to focus on as you go through the material.

Sidebars

Sidebars contain information that is interesting but not central to a discussion. For instance, sidebars contain the cancer staging protocols for all the types of cancer discussed.



SIDEBAR 9.8

STAGING THYROID CANCER

Staging protocols for thyroid cancer are tied to the type of cancer, the age of the patient, and the best treatment options under the circumstances. As with other types of cancer, thyroid cancer is staged using the TNM (Tumor Node Metastasis) system. A simplified version of thyroid cancer staging follows:

TUMOR (T)	NODE (N)	METASTASIS (M)
T X: Tumor cannot be assessed	**N X**: Nodes cannot be assessed	**M X**: Metastasis cannot be assessed
T 0: No evidence of primary tumor	**N 0**: No nodes involved	**M 0**: No metastasis found
T 1: Tumor <2 cm, within the boundaries of the thyroid	**N 1a**: Some nodes in neck involved	**M 1**: Distant metastasis to lymph nodes, organs, or bones
T 2: Tumor 2–4 cm, limited to thyroid	**N 1b**: Some nodes in neck and mediastinum involved	
T 3: The tumor is >4 cm, or the tumor has invaded nearby tissue		
T 4a: Tumor any size; has invaded anterior neck tissues		
T 4b: Tumor any size; has invaded posterior neck, spine, or large blood vessels		

These delineations are translated into stages I to IV in this way:

For papillary or follicular thyroid cancer in patients older than 45 years:

Stage I	Any T, any N, M0
Stage II	Any T, any N, M1

For anaplastic thyroid cancer in patients of any age:

Stage IVa	T4a, any N, M0
Stage IVb	T4b, any N, M0
Stage IVc	any T, any N, M1

For papillary or follicular thyroid cancer in patients over 45 years old:

Stage I	T1, N0, M0
Stage II	T2, N0, M0
Stage III	T1–3, N0–N1a, M0
Stage IVa	T1–4a, N0–1b, M0
Stage IVb	T4b, any N, M0
Stage IVc	any T, any N, M1

For medullary thyroid cancer in patients of any age:

Stage I	T1, N0, M0
Stage II	T2–3, N0, M0
Stage III	T1–3, any, M0
Stage IV	T any, N0 any, M0–1

COMPARE AND CONTRAST 2.1

PLANTAR WARTS VS. CALLUSES

Plantar warts often look like simple calluses (the thick skin that grows on areas of the feet that is subject to a lot of wear and tear). The problem is that while people may file or snip off their calluses with no ill effects, to do the same with a plantar wart risks having that wart virus spread all over the foot, leading to more growths until it becomes impossible to walk without pain.

Massage therapists are in a unique position to observe their clients' feet and notice the subtle differences between plantar warts and callus. They may be able to give clients guidance about getting the right kind of care.

CHARACTERISTICS	PLANTAR WARTS	CALLUS
Location	Anywhere on plantar surface of foot. Usually not bilateral.	Appears in areas of wear and tear, especially back of heels and lateral aspect of feet. Callus usually grows in a similar pattern on both feet.
Appearance	May be white, but with darker speckling under thickened skin; this is the capillary supply.	Thick, white skin.
Sensation	Very hard and unyielding, like stepping on a pebble.	No particular sensation.

Compare and Contrast

These charts line up similar conditions for a side-by-side comparison.

Case Histories

Read stories about people who share a personal experience of living with a specific condition.

CASE HISTORY 3.1 **WHIPLASH, THE CLIENT WHO SNEEZED**

A massage therapist met with a first-time client approximately one year after the client was in a car accident. The client was still in considerable pain. He was diagnosed with whiplash and was seeking massage under prescription from his doctor.

The therapist worked slowly and carefully and was encouraged by the client to go deeper into his neck muscles, all the way down to the transverse processes of the neck vertebrae. He felt better after the massage; his muscles were looser, and he had an improved range of motion.

Several hours later, the client sneezed. The force of the motion wrenched his neck and re-traumatized the tissues so that he was in greater pain and more spasm and had much less range of motion than he had before his massage. He returned for another session, but it was ineffective at reducing his pain and dysfunction. He never sought massage again.

What is the moral here? It is utterly unclear whether the first massage put the client at risk for re-injuring himself just by sneezing. The therapist followed all the rules of good sense, worked with a doctor's recommendation, and let the client guide her about how much pressure felt comfortable. Yet it is necessary to entertain the possibility that the massage somehow did put the client at risk, even though the therapist was well informed and made what seemed to be the right decisions. No two people go through the same kind of healing process, and no two people respond to massage the same way. Massage therapists must weigh the benefits and risks of their work on a case-by-case basis. It is impossible to rely only on books and rules to make decisions about whether to give massage.

Notable Cases

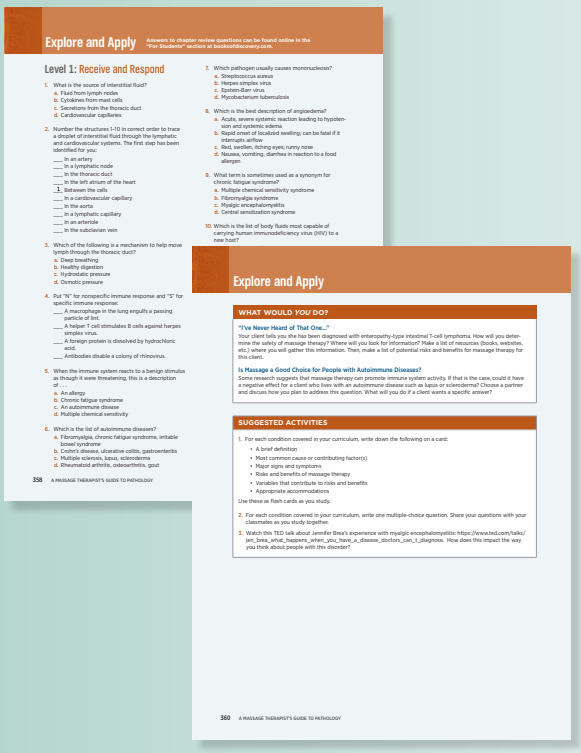
Discover examples of public figures affected by a specific condition.

NOTABLE CASES

It is rumored that the original draft of Das Kapital was spattered with bloodstains from Karl Marx's lanced boils. Many well-known athletes, including Peyton Manning, have had serious staph infections. Michael Jackson had a "MRSA-type" infection after a facial surgery.

Cross-references

Throughout the text, certain condition names are highlighted like **this**, indicating a topic that appears elsewhere in this textbook. Interested readers can find the relevant conditions and make connections to the discussion at hand.


Explore and Apply

Answers to chapter review questions can be found online in the "For Students" section at booksofdiscovery.com

Level 1: Receive and Respond

1. What is the source of interstitial fluid?
   a. Fluid from lymph nodes
   b. Cytokines from mast cells
   c. Secretions from the thoracic duct
   d. Cardiovascular capillaries

2. Number the structures 1-10 in correct order to trace a droplet of interstitial fluid through the lymphatic and cardiovascular systems. The first step has been identified for you:
   ___ In an artery
   ___ In a lymphatic node
   ___ In the thoracic duct
   ___ In the left atrium of the heart
   1 Between the cells
   ___ In a cardiovascular capillary
   ___ In the aorta
   ___ In a lymphatic capillary
   ___ In an arteriole
   ___ In the subclavian vein

3. Which of the following is a mechanism to help move lymph through the thoracic duct?
   a. Deep breathing
   b. Healthy digestion
   c. Hydrostatic pressure
   d. Osmotic pressure

4. Put "N" for nonspecific immune response and "S" for specific immune response:
   ___ A macrophage in the lung engulfs a passing particle of lint.
   ___ A helper T cell stimulates B cells against herpes simplex virus.
   ___ A foreign protein is dissolved by hydrochloric acid.
   ___ Antibodies disable a colony of rhinovirus.

5. When the immune system reacts to a benign stimulus as though it were threatening, this is a description of ...
   a. An allergy
   b. Chronic fatigue syndrome
   c. An autoimmune disease
   d. Multiple chemical sensitivity

6. Which is the list of autoimmune diseases?
   a. Fibromyalgia, chronic fatigue syndrome, irritable bowel syndrome
   b. Crohn's disease, ulcerative colitis, gastroenteritis
   c. Multiple sclerosis, lupus, scleroderma
   d. Rheumatoid arthritis, osteoarthritis, gout

7. Which pathogen usually causes mononucleosis?
   a. Streptococcus aureus
   b. Herpes simplex virus
   c. Epstein-Barr virus
   d. Mycobacterium tuberculosis

8. Which is the best description of angioedema?
   a. Acute, severe systemic reaction leading to hypotension and systemic edema
   b. Rapid onset of localized swelling; can be fatal if it interrupts airflow
   c. Red, swollen, itching eyes; runny nose
   d. Nausea, vomiting, diarrhea in reaction to a food allergen

9. What term is sometimes used as a synonym for chronic fatigue syndrome?
   a. Multiple chemical sensitivity syndrome
   b. Fibromyalgia syndrome
   c. Myalgic encephalomyelitis
   d. Central sensitization syndrome

10. Which is the list of body fluids most capable of carrying human immunodeficiency virus (HIV) to a new host?

358 A MASSAGE THERAPIST'S GUIDE TO PATHOLOGY

Explore and Apply

WHAT WOULD *YOU* DO?

"I've Never Heard of That One..."

Your client tells you she has been diagnosed with enteropathy-type intestinal T-cell lymphoma. How will you determine the safety of massage therapy? Where will you look for information? Make a list of resources (books, websites, etc.) where you will gather this information. Then, make a list of potential risks and benefits for massage therapy for this client.

Is Massage a Good Choice for People with Autoimmune Diseases?

Some research suggests that massage therapy can promote immune system activity. If that is the case, could it have a negative effect for a client who lives with an autoimmune disease such as lupus or scleroderma? Choose a partner and discuss how you plan to address this question. What will you do if a client wants a specific answer?

SUGGESTED ACTIVITIES

1. For each condition covered in your curriculum, write down the following on a card:
   - A brief definition
   - Most common cause or contributing factor(s)
   - Major signs and symptoms
   - Risks and benefits of massage therapy
   - Variables that contribute to risks and benefits
   - Appropriate accommodations

   Use these as flash cards as you study.

2. For each condition covered in your curriculum, write one multiple-choice question. Share your questions with your classmates as you study together.

3. Watch this TED talk about Jennifer Brea's experience with myalgic encephalomyelitis: https://www.ted.com/talks/jen_brea_what_happens_when_you_have_a_disease_doctors_can_t_diagnose. How does this impact the way you think about people with this disorder?

360 A MASSAGE THERAPIST'S GUIDE TO PATHOLOGY

Explore and Apply

You'll find **chapter review questions** in the **Explore and Apply** section at the end of each chapter. The questions are written at three levels of complexity.

- The first level, "**Receive and Respond**," checks for basic understanding.
- Next, the "**Application of Concepts**" questions invite you to think about your knowledge in the context of real-life practice.
- Finally, the "**What Would You Do?**" questions are intended as open-ended discussion prompts to promote the integration of what you learn in pathology, business, ethics, and other parts of your massage therapy education.

These chapter review questions help to reinforce key concepts in multiple choice, matching, and short-answer formats and can be used as student assignments, study recommendations, or small group activities.

You'll also find a list of **Suggested Activities** to help deepen your understanding of the material.

Chapter 1: Fundamental Concepts in Pathology

Chapter 1 introduces the language and the basic concepts that frame our discussion of pathology. Here you will find Greek and Latin word roots, basic vocabulary, a discussion of adverse effects and evidence-informed practice, a discussion of pathogens and their mechanisms, hygiene for massage therapy settings, and an overview of the inflammatory process. Chapter 1 also introduces specific aspects of critical thinking and practical application of knowledge and skills that will be reinforced throughout the text.

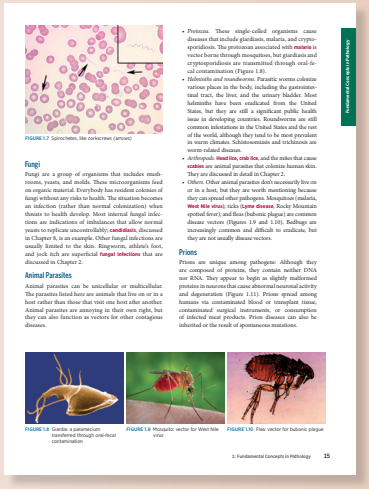


FIGURE 1.7 Spirochetes, like corkscrews (arrows)

Fungi

Fungi are a group of organisms that includes mushrooms, yeasts, and molds. These microorganisms feed on organic material. Everybody has resident colonies of fungi without any risks to health. The situation becomes an infection (rather than normal colonization) when threats to health develop. Most internal fungal infections are indications of imbalances that allow normal yeasts to replicate uncontrollably; **candidiasis**, discussed in Chapter 8, is an example. Other fungal infections are usually limited to the skin. Ringworm, athlete's foot, and jock itch are superficial **fungal infections** that are discussed in Chapter 2.

Animal Parasites

Animal parasites can be unicellular or multicellular. The parasites listed here are animals that live on or in a host rather than those that visit one host after another. Animal parasites are annoying in their own right, but they can also function as vectors for other contagious diseases.

- *Protozoa.* These single-celled organisms cause diseases that include giardiasis, malaria, and cryptosporidiosis. The protozoan associated with **malaria** is vector borne through mosquitoes, but giardiasis and cryptosporidiosis are transmitted through oral-fecal contamination (Figure 1.8).
- *Helminths and roundworms.* Parasitic worms colonize various places in the body, including the gastrointestinal tract, the liver, and the urinary bladder. Most helminths have been eradicated from the United States, but they are still a significant public health issue in developing countries. Roundworms are still common infestations in the United States and the rest of the world, although they tend to be most prevalent in warm climates. Schistosomiasis and trichinosis are worm-related diseases.
- *Arthropods.* **Head lice, crab lice,** and the mites that cause **scabies** are animal parasites that colonize human skin. They are discussed in detail in Chapter 2.
- *Others.* Other animal parasites don't necessarily live on or in a host, but they are worth mentioning because they can spread other pathogens. Mosquitoes (malaria, **West Nile virus**), ticks (**Lyme disease,** Rocky Mountain spotted fever); and fleas (bubonic plague) are common disease vectors (Figures 1.9 and 1.10). Bedbugs are increasingly common and difficult to eradicate, but they are not usually disease vectors.

Prions

Prions are unique among pathogens: Although they are composed of proteins, they contain neither DNA nor RNA. They appear to begin as slightly malformed proteins in neurons that cause abnormal neuronal activity and degeneration (Figure 1.11). Prions spread among humans via contaminated blood or transplant tissue, contaminated surgical instruments, or consumption of infected meat products. Prion diseases can also be inherited or the result of spontaneous mutations.

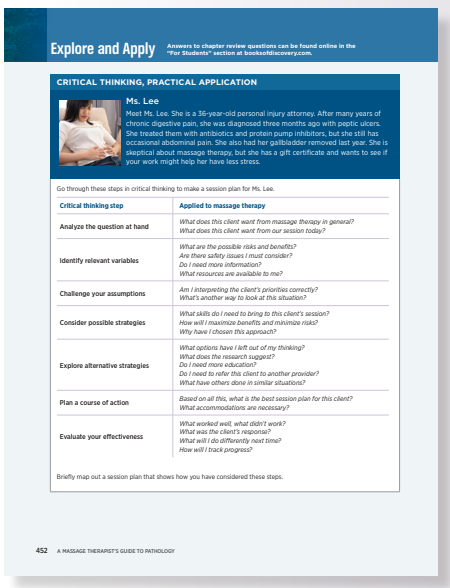
FIGURE 1.8 Giardia: a paramecium transferred through oral-fecal contamination

FIGURE 1.9 Mosquito: vector for West Nile virus

FIGURE 1.10 Flea: vector for bubonic plague

Chapters 2–11: The Systems and Associated Conditions

Chapters 2 through 11 are organized by body systems. Each chapter begins with an overview of how the system works when it is healthy to provide a context for what happens when disease or injury occurs. Then each condition is discussed with its definition, pathophysiology, signs and symptoms, treatment options, as well as the medications likely to be used to treat it. Additional discussions might include types of the conditions and possible complications. You will also find:



Explore and Apply Answers to chapter review questions can be found online in the "For Students" section at booksofdiscovery.com.

CRITICAL THINKING, PRACTICAL APPLICATION

Ms. Lee

Meet Ms. Lee. She is a 36-year-old personal injury attorney. After many years of chronic digestive pain, she was diagnosed three months ago with peptic ulcers. She treated them with antibiotics and protein pump inhibitors, but she still has occasional abdominal pain. She also had her gallbladder removed last year. She is skeptical about massage therapy, but she has a gift certificate and wants to see if your work might help her have less stress.

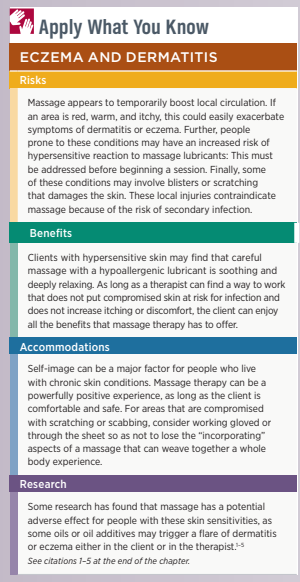
Go through these steps in critical thinking to make a session plan for Ms. Lee.

Critical thinking step	Applied to massage therapy
Analyze the question at hand	*What does this client want from massage therapy in general?* *What does this client want from our session today?*
Identify relevant variables	*What are the possible risks and benefits?* *Are there safety issues I must consider?* *Do I need more information?* *What resources are available to me?*
Challenge your assumptions	*Am I interpreting the client's priorities correctly?* *What's another way to look at this situation?*
Consider possible strategies	*What skills do I need to bring to this client's session?* *How will I maximize benefits and minimize risks?* *Why have I chosen this approach?*
Explore alternative strategies	*What options have I left out of my thinking?* *What does the research suggest?* *Do I need more education?* *Do I need to refer this client to another provider?* *What have others done in similar situations?*
Plan a course of action	*Based on all this, what is the best session plan for this client?* *What accommodations are necessary?*
Evaluate your effectiveness	*What worked well, what didn't work?* *What was the client's response?* *What will I do differently next time?* *How will I track progress?*

Briefly map out a session plan that shows how you have considered these steps.

- **"Meet Ms. Lee . . ."** At the beginning of Chapters 2–11 readers are introduced to a client who lives with some combination of conditions to be covered in that chapter.

- In the **Critical Thinking, Practical Application** section at the end of the chapter you will be invited to form a session plan with carefully analyzed decisions about massage therapy or bodywork for that client. This exercise will give you a chance to use the information in the chapter to develop your critical thinking skills about how you will put that knowledge to work.



Apply What You Know

ECZEMA AND DERMATITIS

Risks

Massage appears to temporarily boost local circulation. If an area is red, warm, and itchy, this could easily exacerbate symptoms of dermatitis or eczema. Further, people prone to these conditions may have an increased risk of hypersensitive reaction to massage lubricants: This must be addressed before beginning a session. Finally, some of these conditions may involve blisters or scratching that damages the skin. These local injuries contraindicate massage because of the risk of secondary infection.

Benefits

Clients with hypersensitive skin may find that careful massage with a hypoallergenic lubricant is soothing and deeply relaxing. As long as a therapist can find a way to work that does not put compromised skin at risk for infection and does not increase itching or discomfort, the client can enjoy all the benefits that massage therapy has to offer.

Accommodations

Self-image can be a major factor for people who live with chronic skin conditions. Massage therapy can be a powerfully positive experience, as long as the client is comfortable and safe. For areas that are compromised with scratching or scabbing, consider working gloved or through the sheet so as not to lose the "incorporating" aspects of a massage that can weave together a whole body experience.

Research

Some research has found that massage has a potential adverse effect for people with these skin sensitivities, as some oils or oil additives may trigger a flare of dermatitis or eczema either in the client or in the therapist.[1–5]

See citations 1–5 at the end of the chapter.

- **Apply What You Know.** At the conclusion of every pathology topic you will find the feature, **Apply What You Know**, which contains a discussion of comparative risks and benefits regarding massage therapy in the context of the pathology, along with some specific ideas for appropriate client accommodations. If relevant research is available, a brief synopsis of that research will be found here, with notes to the articles cited at the end of each chapter.

Chapters 12: Cancer Concepts

Although various types of cancer are covered in other chapters, Chapter 12 is solely dedicated to a discussion of massage therapy in the context of cancer in general. This chapter looks at the process of metastasis, what treatment options are available for cancer patients, and describes when and how massage therapy applications must be adapted for the special challenges of these diseases and their treatments.

Appendices

Additional Pathologies—At a Glance (**Appendix A**) provides thumbnail sketches of about 100 conditions and subtypes that are not often seen in everyday practice but have some important relevance for massage therapists.

Appendix A

Additional Pathologies—At a Glance

Abortion, Spontaneous and Elective

Apply What You Know

Acromegaly

These helpful appendices are available as online resources:

- **Research Literacy** (**Appendix B**) picks up on themes introduced in Chapter 1 with guidance for how to become a research-literate professional, and how to use those skills to achieve the best possible client outcomes.
- **Medications** (**Appendix C**) is fully revised and updated, with emphasis on medication side effects and strategies for appropriate massage therapy accommodations.
- **Massage Therapy in Hospitals and Other Health Care Settings** (**Appendix D**) is an introduction to working in clinical situations. It covers basic concepts; it provides guidelines for integrating massage therapy with conventional medical care; and it prepares readers for further education in this important specialty.

Glossary

Don't get stuck on unfamiliar words—consult the full glossary with definitions of key terms.

ONLINE RESOURCES FOR STUDENTS

Additional resources to support your learning in each chapter are available online in the "**For Students**" section at **booksofdiscovery.com**.

Videos View videos from each chapter to see the author simplifying complex ideas and providing a context to deepen your understanding.

Answers to Chapter Review Questions Check your progress with the answers to Chapter Review Questions.

Practice Intake Forms Practice critical thinking and session planning skills with intake forms from actual clients.

Bibliography Learn more about any given topic from the complete online bibliography.

Audio Glossary Discover how to correctly pronounce key terms and pathologies.

Suggested Readings Find a list of suggested readings to further your pathology education.

ONLINE RESOURCES FOR INSTRUCTORS

A Massage Therapist's Guide to Pathology and its supporting materials have been configured to make teaching pathology as successful, satisfying, and rich as possible. The text can guide students from a basic pathology vocabulary up through complex session planning, with your help to identify the key decision-making points along the way.

PowerPoint PowerPoint slides are organized by chapter or by topic, so you can customize your own slide deck for each class.

Image Library Art from the text is available in an easily downloadable format.

Test Bank The Test Bank is thoroughly revised and updated, and contains over 1,000 items. Questions address each topic in the book and are written at two levels of complexity: Level 1 questions assess the retention of basic concepts, while Level 2 questions focus on application of knowledge. You can choose a selection of questions for a quiz or test. You can also use items from the Test Bank as independent study assignments to help reinforce material that is not addressed during class time.

Curricula Two syllabi with suggestions for both 40-hour and 60-hour pathology courses are provided for educators or school programs looking for guidance in building a usable teaching guide.

All of the teaching ancillaries coordinate with ELAP recommendations for curriculum development and assessment. You'll also find a chart laying out ELAP recommendations for pathology education and where that content is located in *A Massage Therapist's Guide to Pathology.*

FIGURE 3.6 Osgood-Schlatter disease: a nontender enlargement of the tibial tuberosity

Osteoporosis

Definition: What Is It?

Osteoporosis literally means "porous bones." In this condition, calcium is pulled off the bones faster than it is replaced, leaving them thin, brittle, and prone to injury.

Demographics

Osteoporosis has been diagnosed in about 10 million Americans, but about 43 million others have a silent pre-osteoporotic condition called osteopenia. Women with osteoporosis outnumber men by about 4 to 1, for a variety of reasons. It is estimated that about 30% of postmenopausal women in the United States and Europe are at risk for osteoporosis, and about 40% of them will have at least one osteoporosis-related fracture in their lifetime.

Osteoporosis is more common among Caucasians and Asians than among other races. This condition is usually diagnosed in people older than 60, but it is closely tied to events, habits, and activities of earlier years.

In the United States, about 2 million hip, spinal, and wrist fractures are identified as complications of osteoporosis each year. These events lead to over 400,000 hospital visits and 180,000 nursing home admissions every year.

Primary osteoporosis is almost exclusively seen in mature adults, unless a genetic condition or other problem interferes with bone density in childhood. Young people who fail to achieve good bone mass by early adulthood are very much at risk for problems with bone thinning later in life.

Pathophysiology: What Happens?

Bones are composed of hard mineral deposits (mostly calcium phosphate) formed on an organized scaffold of collagen fibers. The volume of mineral deposits determines bone density. People normally accumulate most of their bone density by about age 20, but small gains are made until around age 30 to 35. After that point, either density is maintained at a stable level, or withdrawals are made from this "calcium bank." The turnover of mineral deposits happens constantly, but this activity occurs in trabecular bone at a higher rate than in cortical bone. Osteoporosis develops when calcium is withdrawn from bone tissue faster than it is deposited.

Risk factors for osteoporosis are typically described as controllable or noncontrollable. Noncontrollable factors include gender (women are more at risk because of childbearing and breast-feeding, as well as having smaller bones to begin with); age; body size (smaller people are more at risk than are larger ones); ethnicity; and family history. Controllable risk factors include hormone levels, levels of calcium and vitamin D, medications, sedentary lifestyle, diet, and cigarette and alcohol use.

Osteoporosis can be the consequence of some other medical conditions, including **diabetes**, **anorexia** or **bulimia**, problems with absorption in the gastrointestinal tract, and **hyper-** and **hypothyroidism**. **Rheumatoid arthritis** and **chronic obstructive pulmonary disease** can cause it. Dangerously weak bones are also a common and serious side effect of both radiation and the drugs used to treat many forms of **cancer**.

Logically, high calcium consumption should lead to high bone density, and high bone density should be linked to a low risk of osteoporosis and bone fractures. However, many factors beyond calcium influence bone health, including the accessibility of other vitamins and minerals, exercise habits, pH balance in the blood (especially as it is influenced by protein consumption), other diseases, medications, and even emotional state. The factors that help to determine a person's risk for osteoporosis boil down to variables in calcium absorption, calcium loss, and bone density maintenance.

- *Calcium absorption*. Calcium requires an acidic environment to be absorbed into the bloodstream. When the secretion of hydrochloric acid is reduced with age, it becomes harder to absorb dietary calcium.

  Some vitamins influence how the body uses calcium. Vitamin D controls absorption and retention of this

important mineral. The body synthesizes vitamin D in response to direct sunlight (it takes about 15 minutes of exposure per day, depending on latitude), but vitamin D can also be easily supplemented. Vitamin K, found in many dark, leafy greens, also supports calcium absorption. Preformed vitamin A, however, can increase the risk of fractures if it is consumed in high quantities.

Some other substances also interfere with calcium uptake, including oxalates (found in spinach, chard, chocolate, and some other foods); alcohol; and insoluble fiber.

- *Calcium loss*. Calcium is constantly lost in sweat and urine. Some substances, specifically proteins, cause high levels of calcium to be excreted in urine. Diets high in salt are also associated with accelerated calcium loss.

  The onset of **menopause** is another big factor in calcium levels. Low estrogen secretion causes osteoclasts to speed up, and osteoblasts to slow down. Ultimately women can lose 30%–40% of their cortical bone and up to 50% of their trabecular bone density over a lifetime.

  Several other factors can lead to calcium loss. High caffeine consumption (more than three or four cups of coffee or servings of caffeinated soda per day) has been seen to have a negative impact. Other factors include medications (chemotherapeutic agents, corticosteroids, some diuretics, anticonvulsant drugs); **hyperthyroidism**; heavy alcohol use; smoking; inflammatory bowel disease (**Crohn's disease, ulcerative colitis**); a history of **eating disorders**; and endocrine disorders, including **Cushing's syndrome**, low testosterone, and low estrogen.
- *Bone density maintenance*. The shape and density of bones are determined by the activity of osteoclasts and osteoblasts. These cells work to remodel bones according to the commands of calcitonin, parathyroid hormone, estrogen, and progesterone. If hormones tell the osteoclasts to work faster than the osteoblasts, bone density declines. Osteoblasts and osteoclasts are most active in trabecular bone, which is found in epiphyses of long bones and in vertebral bodies. The loss of key struts of calcium deposits in these areas can cause bones to collapse.

NOTABLE CASES

Many celebrities have shared their osteoporosis experiences with the public, including actresses Sally Field, Blythe Danner, and the late comedian Joan Rivers. Several influential men have had this condition as well, including Pope John Paul II, Winston Churchill, Clarence Darrow, and very possibly Benjamin Franklin.

Bones are not the only part of the body that needs calcium. Calcium is consumed in nearly every chemical reaction that results in muscle contraction and nerve transmission, and it is essential to blood clotting. It also works as a chemical buffer to help maintain proper pH balance in the blood. The body has a strict prioritizing system for these important functions: Chemical reactions that promote moment-to-moment survival are more important than maintaining the density of the vertebral bodies or femoral neck. Therefore, if blood levels of calcium are low, these bones give up some of their mineral structure to correct that shortfall.

When a person develops osteoporosis, it is usually because the balancing act between calcium absorption, calcium loss, and bone density maintenance is upset, so the calcium in the bones is pulled off faster than it is replaced. The bones, especially in the spine and femur, become progressively less dense, leaving the person vulnerable to the main complications of this disease: spinal or hip **fractures** (Figures 3.7–3.9).

Signs and Symptoms

Osteoporosis has no symptoms in its early stages. People who are at particularly high risk may undergo testing to try to identify it early, but it is often missed until complications, specifically fractures, develop.

Symptoms of osteoporosis center on pathologically weak bones. Thinned or collapsed vertebrae lead to a loss of height and the characteristic rounded "widow's hump" of **hyperkyphosis**. Chronic or acute back pain appears

FIGURE 3.7 Demonstrable bone loss at vertebral bodies with osteoporosis

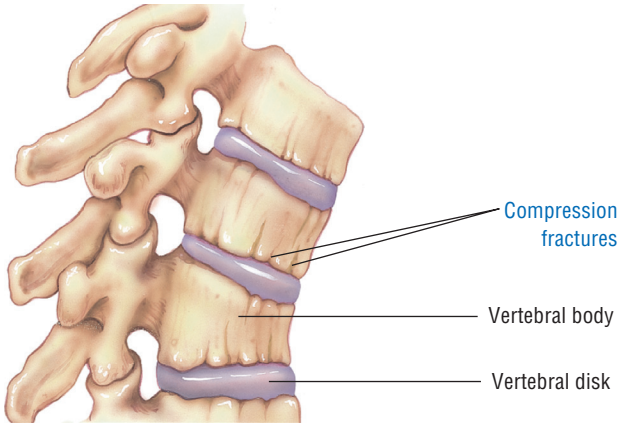


FIGURE 3.8 Vertebral bodies with compression fractures

in this stage as the vertebrae continue to degenerate. Pain is worse with activity; it can be relieved by lying supine. Spasm of the paraspinal muscles is common, and patients may greatly limit their activity, even to becoming bedridden, to avoid exacerbating their discomfort.

Complications

People with osteoporosis are prone to fractures with little or no cause; these are called spontaneous or pathological fractures. Hips (usually the femoral neck rather than the ilium), vertebrae, and wrists are particularly vulnerable to breakage. Brittle ribs are often associated with osteoporosis due to corticosteroid use. And since in advanced age people are naturally low on both living osteocytes and growth hormone to support the healing process, it is difficult to recover from any injury of this severity. Most elderly people who break a hip due to osteoporosis never return to their pre-fracture levels of activity.

Treatment

Once osteoporosis has been recognized and rated for severity, a number of treatment options are available to keep it from getting worse. Pharmaceutical interventions include hormone replacement therapy to influence estrogen or calcitonin; bisphosphonates; selective estrogen receptor modulators (SERMs); and some others. None of these interventions is risk free, however, and osteoporosis patients must weigh risks and benefits of these medications carefully.

Exercise is almost always a part of the osteoporosis treatment strategy. Since bone remodels according to the stresses placed on it, weight-bearing stress ensures that maintaining healthy mass is a high priority. Diet also plays an important part in dealing with osteoporosis. Specific vitamins and other substances may improve calcium uptake, even for postmenopausal women, but that subject is outside the scope of this book.

MEDICATIONS

- Vitamin and mineral supplements, including calcium, vitamin D, and others
- Hormone replacement therapy (including calcitonin) to slow bone loss
- SERMs to slow bone loss
- Bisphosphonates to slow bone loss
- Parathyroid hormone analogues to accelerate bone growth

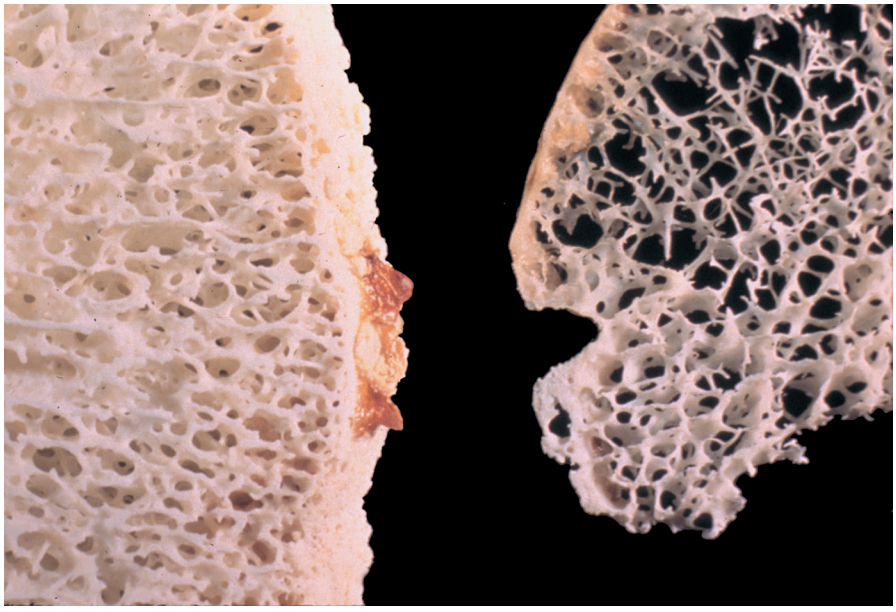


FIGURE 3.9 Loss of bone density in femoral head with osteoporosis

- RANK ligand inhibitors to interfere with osteoclast formation

Prevention

It is possible to prevent osteoporosis, feasible to slow it down or halt it, and difficult to reverse it. The causes of this disease vary, but they center on one theme: The time to build up calcium reserves is in youth and early adulthood. The skeleton grows in height until about age 20, but it continues to accumulate density until about age 30. After that point, it either stays stable or progressively demineralizes. Four key steps are recommended to achieve and maintain optimal bone density and avoid osteoporosis:

- *Get dietary calcium from absorbable sources.* Low-fat dairy products are convenient, but not the most efficient source for some people. Other recommended calcium sources include dried beans and greens: legumes and most green leafy vegetables. (Spinach and chard, while rich in calcium and other nutrients, also have oxalates that limit calcium absorption.) Calcium supplements vary in absorbability; calcium carbonate, calcium phosphate, and calcium citrate are generally recognized to have good accessibility.
- *Exercise.* Weight-bearing stress makes it necessary for the body to maintain healthy bone density.
- *Get vitamin D.* The Recommended Dietary Allowance for vitamin D is 200 units, or 5 µg/day. This can be ingested in supplement form or naturally synthesized by exposure to sunlight.
- *Avoid substances and behaviors that pull calcium off bones.* These include tobacco use, a lot of salt, too much protein, and excessive caffeine and alcohol.

Apply What You Know

OSTEOPOROSIS

Risks

The primary risk for a person with osteoporosis who receives massage is that a fracture may occur because of undue pressure or problematic positioning on the table. It is important also to remember that elderly clients are unlikely to have only one pathology: This is a population that may have several problems in addition to osteoporosis that influence bodywork choices.

Benefits

Massage therapy won't reverse osteoporosis, but it can be a helpful intervention for pain and limited range of motion. Any work that respects a client's fragility while working for pain relief is safe and appropriate.

Accommodations

Clients with osteoporosis may need imaginative bolstering to create a setting in which it is safe and comfortable to receive massage. Pillows, bolsters, rolled-up towels, or other tools may be needed to firmly "nest" them into the table for maximum comfort. In addition to extra bolstering, clients with osteoporosis may benefit from having extra help getting on and off the table.

Research

Guo et al.[1] report on a case in which an elderly man sustained a broken lumbar pedicle after receiving a back massage. This supports considering osteoporosis as a risk when working with older clients. On a happier note, some evidence[2] indicates that even a single skilled massage may help elders with balance and postural stability, thus helping to prevent falls, which are a big risk for people with osteoporosis.

See citations 1–2 at the end of the chapter.

Postural Deviations

Definition: What Are They?

Although it is tempting to think about the spine like a strong, rigid ship's mast, a column, or a tent pole held erect by muscular tension, it is actually much stronger than any of those. Healthy curves in the cervical, thoracic, and lumbar regions give the spine much more resistance to force and weight-bearing stress than it would have if it were straight. However, sometimes these curves are overdeveloped, which reduces resiliency and strength rather than enhancing it. Hyperkyphosis (humpback); hyperlordosis (swayback); and scoliosis (S, C, or reverse-C curve); and rotoscoliosis (scoliosis with a twist) are the specific postural deviations addressed here (Figure 3.10).

Pathophysiology: What Happens?

Postural deviations occur when the spine's normal curvature is over-exaggerated or moves out of normal planes enough to cause problems. Mild forms may not cause any visible signs or impairment in function, but more severe cases can interfere with pain-free movement and overall function.

The causes of most postural deviations are not fully understood. As we explore this problem, we may find that causes are tied to multiple factors, including bone density, environmental exposures, genetic predisposition, and