THE AGING HUMAN BODY

Ensconced in the comfort and security of air-conditioned warmth in well-lighted homes, we forget the terror-stricken nights and brutally brief lives of our earliest human ancestors.

Endowed with neither tooth nor claw, few animals were at greater risk for nine months than a pregnant woman and few creatures are more helpless than the human infant during the first few years of life. However, the continuing presence of the human species confirms that a sufficient number of our ancestors survived to achieve sexual maturity by age 10-11 to reproduce and provide a continuing link in the human genetic chain. The skeleton of every man, woman and child on this planet continues to be haunting testimony of those primitive days, when the human creature was simply another animal, struggling to survive.

The human body goes through two periods of rapid growth. The first is from birth to age three. The second is during puberty. Most **boys** reach their peak height around the age of 16. However, **men** still develop in other ways well into their twenties. Research has found that the brain and skeleton don't fully develop **until** the age of **25** and **men** usually achieve peak skeletal and muscle mass somewhere between the ages of 20 and 30. But, from any peak, there is only one direction to go…down!

Reflecting the brevity of our ancestral lifespan, skeletal bone loss begins around age 25 and continues throughout life. As bones age, they become hollower from bone loss of *osteoporosis* and grow larger in diameter. The increase in diameter counters the internal bone loss and makes fracture less likely. However, we pay a price for this protection. And that price is **osteoarthritis**.

The bones of the human skeleton validate our species and define our individuality. The adult human skeleton contains 206-213 bones, which are linked to each other by variable types of hinges, known as "joints." The bones are moved by muscles that comprise the **Musculoskeletal System**. Any process that interferes with the function of these joints is commonly spoken of as *"arthritis."* **Arthritis** is a general term used for conditions that cause joint pain, stiffness, swelling and progressive lack of mobility. There are over 200 different types of arthritis, but, in general they fall into two categories, *"inflammatory arthritis"* and *"non-inflammatory arthritis."*

OSTEOARTHRITIS

As we age, non-inflammatory, *"Osteoarthritis,"* becomes nearly a universal affliction. Osteoarthritis is commonly spoken of as the result of wear-and-tear. This explanation has popular appeal by comparing the skeleton to a purely mechanical structure that eventually wears out with age. But, it is only a half-truth. *Wolf's Law*, states that bone is laid down in response to stress. This is the main cause of **osteoarthritis** with age. There is more stress on a bone where it connects to another bone than in mid-shaft. This cumulative extra bone deforms the joints and ultimately destroys the underlying cartilage. Deformed joints wear out quicker, both in their anatomic structure and in their function. Since the

deformity is a result of excess bone, there is no specific inflammatory component such as is present with *Rheumatoid* arthritis. The pain from an arthritic joint, results in muscle spasm. This, in turn, causes further pain in a region removed from the joint. Genetic differences influence the severity of such involvement.

The dominant joints involved in *osteoarthritis* are weight-bearing, such as *knees* and *hips*. The hands are characteristically involved with the tip of the finger joints and the middle knuckles usually involved. These are referred to as, *"Heberden's Nodes*" and "*Bouchard's Nodes."* The joints next to the palm of the hand are not involved. These are reserved for Rheumatoid arthritis.

With the aches and pains of osteoarthritis, there is a normal tendency to become more sedentary and move less. It is important, however, to maintain strength in the muscles around the joints. Muscles and musculotendinous tissues support the joints and relieve some of the stress imposed on damaged joints. Without strength in these tissues, the full burden of body weight falls on already compromised bones of the knees and hips.

Therapy for Osteoarthritis

Weight loss is beneficial, simply by taking weight off of the hips and knees. There are a number of "anti-inflammatory" medications available, both over-the-counter and by prescription. These are helpful in relief of aches and pains. But, they should be taken under the supervision of your physician. Many of these products are related to aspirin. They should be taken with caution, especially in persons on blood-thinners or in those with sensitive stomachs. Joint protection measures are appropriate, such as wearing leather gloves while performing gardening tasks or yard work. Tylenol (acetaminophen) is also an appropriate medication for minor aches and pains. It is equal to aspirin in relieving pain, but it does not have the same harmful effect on your stomach. Nor does it have an anti-inflammatory effect.

The bones of hip and knees are cushioned by cartilage. Cartilage is one of the few tissues that will not regenerate from damage. In the absence or with severe damage of cartilage, the usual option is surgery. Hip and knee replacement surgeries have extended the lives and functions of countless individuals.

RHEUMATOID ARTHRITIS

Despite its name, *Rheumatoid Arthritis* is *not simply* a disease of joints. It is an auto-immune disease that attacks blood vessels in many parts of the body. However, joints are the most commonly noted tissues whose involvement may result in crippling and deforming arthritis. In contrast to osteoarthritis, it involves many small joints, in addition to the large joints of hips and knees. As previously noted, the joints adjacent to the palm of the hand and balls of the feet are almost universally involved.

According to the Arthritis Foundation; the average onset of *Rheumatoid Arthritis* is between the ages of **30** and **60 years old.** Younger children can also get it. Women tend to be diagnosed slightly earlier than men, potentially due to hormonal changes in the mid-30s and then again after the mid-40s. The joints are painful to move, swollen, warm and tender to touch.

Therapy is aimed primarily at suppressing the overactive immune response. Known for years as the "crippling arthritis," recent advances in therapy have accomplished a near-cure of this disease. Because of the complexity of auto-immunity, it is recommended that a **Rheumatologist** be consulted for treatment. The pain and stiffness of Rheumatoid arthritis tends to improve with movement. Osteoarthritis may be more symptomatic with movement. Rheumatoid symptoms are usually worse in the morning, on wakening. This is known as the "Gel-Effect." The longer it takes for the pain and stiffness to wear off, the more severe the disease. Appropriate early treatment can prevent deformity of rheumatoid disease.

OSTEOPOROSIS

Osteoporosis is weakening of the bones, through bone loss, that begins at age 25. The primary stimulus to bone formation is body weight. Osteoporosis is the most commonly encountered problem in extended space flight since gravity is less and body weight is reduced. If a man of age 60 is confined to strict bed rest for one month, he will lose the equivalent of 17 years bone loss. Medications are available to treat osteoporosis and prevent fractures.

OTHER AGING PHENOMENA

Changes in Height

The dominant factor in loss of height with aging is due to poor posture, bone loss causes spinal compression fractures while diminutions in thickness of the intervertebral discs or cushions further decrease our height. The vertebrae in men are heavier and sturdier than in women. As a result, women suffer more from osteoporosis-induced forward curvature of the spine. Men become more barrel-chested.

Intolerance of cold

With increasing age, the subcutaneous (beneath the skin) fat melts away. The loss of this insulation makes us less tolerant to cold. At the same time, skin wrinkles to increase the surface area of the body that is exposed to the elements. With age, our facial features become sharper and our tolerance to cold decreases.

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