

Age-Related Changes

Gastrointestinal Aging

Changes:

- ↑ Poor dentition
- ↓ Number of taste buds
- ↓ Muscle strength for chewing
- ↓ Saliva production
- ↓ Ptyalin in saliva
- Weakened gag reflex
- ↓ Gastric acid secretion
- ↓ Emptying of esophagus and stomach
- ↓ Intrinsic factor
- Thickened bile
- Thinned gastric mucosa
- ↓ Ability of small intestine to adsorb sugars and lipids
- ↓ Hepatic enzymes and storage capacity

Consequences

- ↓ Taste sensation
- ↓ Appetite
- ↓ Chewing ability
- ↓ Digestion of starch
- ↓ Tolerance for fats
- ↑ Dental caries
- Possible swallowing difficulty
- Indigestion, flatus
- Risk of pernicious anemia
- Possible change in drug metabolism
- Difficulty in gaining weight
- Weight loss
- Fatigue
- Constipation

Genitourinary Aging

Changes

- ↓ Number of nephrons
- ↓ Glomerular filtration rate and tubular reabsorption
- Change in renal threshold
- ↓ Blood flow to kidneys
- ↓ Bladder capacity from 500 ml to 250 ml
- ↓ Elasticity of bladder
- ↓ Bladder tone
- ↓ Muscle tone of urethra
- Benign prostatic hyperplasia common in males

Consequences:

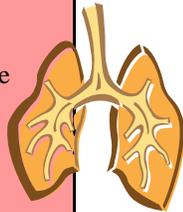
- ↓ Creatinine clearance
- ↓ Ability to concentrate urine
- ↑ Risk of urinary retention
- ↑ Incidence of incontinence
- ↑ Urinary frequency; nocturia
- ↑ FALLS
- Effects on drug clearance via kidneys

Respiratory Aging Changes:

- ↓ Elasticity of lungs
- ↓ Number of alveoli
- ↑ Size of alveoli
- ↑ Diameter of alveolar ducts and bronchioles
- ↓ Ciliary action
- ↑ Anteroposterior chest diameter
- Weakening of respiratory muscles
- ↓ Coughing reflex
- Calcification of costal cartilages

Consequences:

- 50% increased residual capacity
- ↓ Vital capacity
- ↓ Mobility of bony thorax
- ↓ Arterial blood oxygen level
- ↓ Oxygen uptake during exercise
- ↓ Gas exchange
- ↑ Amount of dead air space
- ↑ Risk of infection
- ↓ Exercise tolerance



Musculoskeletal Aging

Changes

- Muscle cells atrophy
- Generalized symmetrical muscle wasting
- Deminerlization of bones
- Deterioration of cartilage surface of joints
- Thinning of intervertebral discs
- Loss of cartilage in vertebral column
- Loss of elastic fibers in muscle tissue
- Kyphosis



Consequences:

- ↓ Muscle strength after age 70
- Two-inch loss of height between ages 20 and 70
- ↑ Incidence of osteoporosis
- ↑ FALLS
- ↑ Pain
- ↓ Joint range of motion
- ↓ Flexibility
- ↓ Mobility
- ↓ Independence in ADLs
- Gait changes
- Changes in body image
- ↑ Risk of fractures

Cardiovascular Aging

Changes

- ↑ Amount of collagen and fat in cardiac muscle
- Thickening and rigidity of valves
- ↓ Oxygen utilization
- Myocardial hypertrophy, but over-all heart size is not affected by age
- Coronary artery blood flow decreased
- ↑ Peripheral resistance
- ↑ Myocardial irritability



Consequences

- ↓ Stroke volume, cardiac output
- ↓ Ability to increase heart rate in response to stress
- ↑ Aortic volume and systolic blood pressure
- No change in resting heart rate
- ↑ Risk of extra systoles
- Electrocardiogram changes
- Orthostatic
- Hypotensions
- ↑ FALLS

Age-Related Changes

Hearing aging changes

- ↓ Number of nerve cells in cranial nerve
- ↑ Production of cerumen
- ↑ Amount of keratin in cerumen
- Atrophy of rigidity of ossicles
- ↓ Elasticity of tympanic membrane

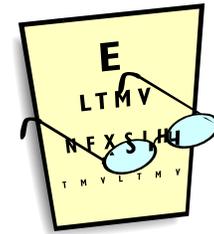
Consequences

- Presbycusis (hearing loss due to age-related changes in the inner ear)
- High frequency loss occurs first
- Tone discrimination loss
- Difficult following conversations
- Cerumen impaction
- Social isolation



Visual aging changes:

- Yellowing, opacity, rigidity of the lens
- ↓ Pupil size
- ↓ Accommodation
- Less efficient adsorption of intraocular fluid
- Narrowing of visual field
- ↓ Lacrimal secretions
- ↓ Number of cones in retina



Consequences

- Presbyopia – inability to focus properly
- Distorted depth perception
- Colour discrimination
- Need for stronger light
- Increased sensitivity to glare
- Drier cornea
- ↑ Risk of FALLS

Integumentary Aging Changes:

- Thinning and atrophy of epidermis
- ↓ Strength and elasticity of epidermis
- ↓ Blood flow
- ↑ Vascular fragility
- Loss of subcutaneous fat
- ↓ Size and function of sweat glands
- ↓ Sebaceous secretions
- “Clustering” of melanocytes
- ↓ Number of nerve cells
- Thinning and graying of scalp, pubic and axilla hair
- Thickening of nasal and ear hair
- ↑ Facial hair in women
- ↓ Blood supply to nailbed
- ↑ Longitudinal striations in nails
- Accumulation of “debris” under nails

Consequences:

- ↑ Susceptibility to infection, trauma, malignant lesions, pressure ulcers
- Skin is dry, scaly, wrinkled
- ↓ Skin turgor
- ↓ Ability to maintain body temperature and homeostasis; baseline temperature may be lower than normal
- Slower rate of healing
- Slower absorption of drugs by subcutaneous route
- “Liver spots”
- Nails thicken, grow slowly, become brittle and yellowed
- ↑ Risk of splitting, infections of the nails

Neurological Aging

Changes:

- ↓ Number of neurons
- ↓ Weight of brain
- Histological changes in brain; ↑ intracellular pigment, ↓ protein synthesis, senile plaques
- ↓ Rate of conduction in peripheral nerves
- Change in sleep patterns
- Depletion of dopamine and some of the enzymes in the brain
- ↓ Accumulation of lipofuscin
- Query diminished brain cholinergic reserve



Consequences:

- ↓ Adaptability
- Slower response to stimuli
- ↓ Sensation
- Impaired proprioception
- Gait changes
- ↓ Deep tendon reflexes
- Slower voluntary movement
- Sleep pattern disturbances
- ↑ Susceptibility to environmental temperature changes
- Hypothermia
- Hyperthermia
- ↓ Short-term memory
- ↑ Risk of FALLS

Developed by the ECLEPs Grant (<http://www.ecleps.org>) Cartwright, Juliana C.; White, Diana and Allen, Tiffany L.

Sources:

Brown, Jeri B., Bedford, Nancy K., White, Sarah J. (1999) Gerontological Protocol for Nurse Practitioners. Lippincott Williams & Wilkins, Inc.;

American Assn. for Geriatric Psychiatry. (2005). Comprehensive Textbook of Geriatric Psychiatry, 3rd Ed. W.W. Norton & Co.

VIHA. Delirium 2006. <http://www.viha.ca/ppp/learning/delirium/AgeRelatedChangesHandout/V2> - 2007