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NEUROPHYSIOLOGY ASSIGNMENT

QUESTION 1: discuss the physiology of sleep

ANSWER:

Sleep is defined as unconsciousness from which a person can be aroused by sensory or other stimuli unlike coma which a person cannot be aroused. There several stages of sleep from very light sleep to very deep sleep. Consciousness typically declines in sleep but is not abolished. Loss of consciousness leads to decreased response to external stimuli and decreased body movement. Depth of sleep is not constant throughout the sleeping period. It varies in different stages of sleep. During sleep, most of the body functions are reduced to basal. Plasma volume decreases by 10% during sleep. Heart rate varies between 45 and 60 beats per minute. Systolic pressure falls to about 90-110mmhg. The lowest is reached about 4th hour of sleep and remains at this level till a short time before waking up. If sleep is disturbed by exciting dreams the pressure is elevated above 130mmhg. Rate and force of respiration is decreased. Respiration becomes irregular and chyne-stroke type of periodic breathing may develop. Salivary secretion is decreased. Urine formation decreases but specific gravity of urine increases. Sweat secretion increases during sleep. Tone in all muscles except ocular muscles decreases very much. The brain is not inactive during sleep. There is a characteristic cycle of brain wave activity during sleep with irregular intervals of dreams. Each night, a person goes through stages of two major types of sleep that alternate with each other. Other types are 1. Rapid eye movement sleep (REM) 2. Non-rapid eye movement sleep or non-REM (NREM) sleep.

RAPID EYE MOVEMENT (paradoxical, desynchronized) SLEEP

This type is associated with rapid conjugate movements of the eyeballs, which occurs frequently. In a normal night of sleep, bouts of REM sleep lasting 5-30 minutes usually appear on average 90 minutes in young adults. In cases where the person is extremely sleepy, bouts of REM is decreased sometimes not seen at all, as more rest persist REM bouts duration is increased. It plays an important role in consolidation of memory. It is associated with dreaming and active bodily muscle movement. The brain is usually active during this sleep type with metabolism increased to 20%.

NON-RAPID EYE MOVEMENT SLEEP

This is also known as deep slow-wave sleep. This type of sleep is exceedingly restful which occupies about 70% to 80% of total sleeping period during non-rapid eye movement sleep there is decrease in both peripheral vascular tone and many other vegetative functions of the body. Non-rapid eye movement sleep is also called “dreamless sleep”, dreams and sometimes even nightmares do occur during slow-wave sleep. Dreams that occur during rapid eye movement sleep are associated with bodily muscle activity which does not in non-rapid eye movement sleep. Slow-wave sleep is usually not remembered because consolidation of the dreams in memory does not occur. Non-rapid sleep can be classified into stages: stage I or stage of drowsiness, stage II or stage of light sleep, stage III or stage of medium sleep and stage IV or stage of deep sleep.

An earlier theory of sleep was that the excitatory areas of the upper brain stem, the reticular activating system, simply became fatigued during waking day and became inactive as a result. An important experiment changed this thinking to the current view that sleep is caused by an active inhibitory process, because it was discovered that transecting the brain stem at the level of the midpons creates a brain cortex that never goes to sleep. In other words, a center located below the midpontile level of the brain stem appears to be required to cause sleep by inhibiting other parts of the brain. Complex pathways between the reticular formation of brainstem, diencephalon and cerebral cortex are involved in the onset and maintenance of sleep. Two centers which induce sleep in the brainstem are the raphe nucleus and the locus ceruleus of pons.

Applied physiology

SOMNAMBULISM: it is also known as walking during sleep or sleep walking (somnus=sleep; ambulare= to walk). This episode last for few minutes to half an hour. It occurs during non-rapid eye movement sleep. In children it is associated with bedwetting or night terror without any psychological disturbance. However, in adults it is associated with psychoneurosis.

INSOMNIA: this is trhe inability sleep or abnormal wakefulness. It is the most common sleep disorder.it occurs due to systemic illness or mental conditions such as psychiatric problems, alcoholic addiction and drug addiction.

HYPERSOMNIA: this is the excess sleep or excess need to sleep. It occurs because of lesion in the floor of the third ventricle, brain tumors, encephalitis, chronic bronchitis and disease of muscles. Hypersomnia also occurs in endocrine disorders such as myxedema and diabetes insipidus.