

## The vertebragenic headache ("Tension headache") and the vertebral spine

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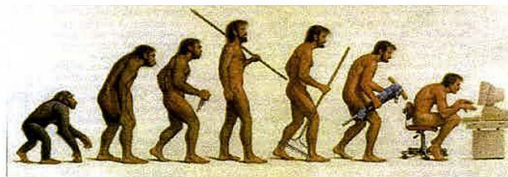
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## Introduction



The erection of man and evolution from „Homo erectus“ to „Homo sedens“

Vertebral column  
term of the description period of  
anatomy

Human axis organ  
central organ of the human body

## Human axis organ I Functions

- Carrying the human head with brain and all important sensory organs
- Carrying the human body
- Responsible for movements of the head in all dimensions
- Fixation of shoulder girdle and the upper extremities
- Fixation of pelvis with the lower limbs
- Fixation of inner organs:
  - chest with cardio-respiratory organs
  - abdominal organs

## Human axis organ II Regulation for posture and turning movements midbrain-pontine centre

- Adaptation of the human body in the gravity field
- Basis for all movements of the human body in the gravity field
- Readaptation of the body position by the postural and turning reflexes due to the vestibular apparatus and the receptors of cervical spine, lumbar and thoracic spine

## Phylogenetic development of the axis organ, the vertebral column

- Tunicata, external skeleton
- Development of Chorda dorsalis (amphioxus)
- Development of cartilage fish
- Development of the vertebral column
  - Horizontal position of the vertebral column
    - bone fish, amphibias, reptiles
      - arch bridge construction, partial developed
    - terrestrial tetrapods (mammalians, aquatic mammallans)
      - arch bridge construction, full developed
  - Vertical position of the vertebral column
    - human being
      - lattice tower construction

## Tunicata, insects, echinoderms



Abb. 7. Seeplattsch (Phoron polyanus).



Abb. 8. Kolonie verstreute Seeplattsch (Urechis lychnoides).

- External skeleton
  - Protozoa
  - Annelida
  - Mollusca
  - Insects
  - Echinoderms
- Muscles, tendons, inner organs are inside the skeleton

## Tetrapods arch bridge construction



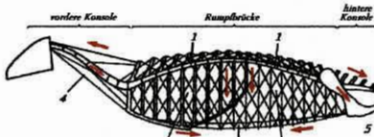
Abb. 6. Schema des Konstruktionsprinzips der Säugerwirbeläule. Nach Storz.



Abb. 4. Schema der Wirbeläule eines primitiven Säugtieres. Nach Bözza.

- Bow consists of two parts: upper belt and lower belt
  - Upper belt: vertebral arch, spine of vertebra, ligamenti, back muscles
  - Lower belt: vertebral body, vertebral disc, ligamenti, short and long tendons, muscles
- bow string: cranial fixed by the ribs (chest), caudal fixed by abdominal muscles

## Tetrapods scheme of the arch bridge construction



- Flat kyphosis of spine (1)
- Bow string long ventral trunk muscles (2)
- Ribs (chest) and diagonal trunk muscles (3)
- Anterior console (4)
- Posterior console (5)

Abb. 7. Schema der Konstruktionsprinzip der Wirbeläule beim Vierfüßler: 1. Wirbeläule in Form einer flachen Kyphose; 2. Sehne in Form der langen ventralen Rumpfmuskeln; 3. Querstreben in Form der Rippen und schrägen Rumpfmuskeln

## Vertebral column in tetrapods

- Thoracic and lumbar spine
  - Fixation of the extremities for standing and locomotion
  - Support in jumping
  - Fixation of ribs and the diaphragm for respiration
  - Fixation of inner organs
- Cervical spine
  - Carrying the head with brain, sensory organs including vestibular apparatus
  - Responsible for free movement of the head
  - Receptors for gravity (neck muscles, tendons, cervical joints)
- Tail, used for balance
  - special motion receptors
- Balance, continuous regulated by postural and turning reflexes of the midbrain centres

## Tetrapods

Spine maximal integrated in the running movement, galloping dog - high speed possible

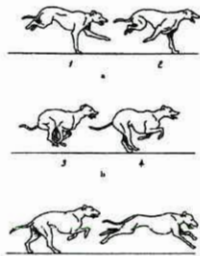


Abb. 8a-c. Bewegungslage eines galoppierenden Hundes mit maximaler Beteiligung der Wirbeläule.

## Tetrapods

big herbivores  
spine serves fixation of the four extremities for standing and locomotion

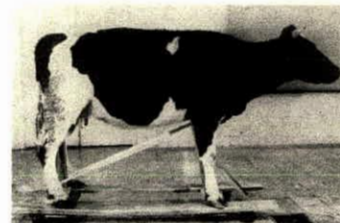


Abb. 9. Ausgestopfte Kuh. Das Präparat zeigt, daß die Bogenbrücke auch nach dem Tode noch tragfähig ist.

**'Great' vertebrates  
tetrapod and bipeds in normal gravity**



**Vertebral column  
change in special biotops**

passager lordosis in the lumbar region



Lithocranium Walleri

- a) Arch bridge construction
- b) Lordosis during feeding

Abb. 11 a. Großwallaby (Lithocranium Walleri) im Stand. Nach Böcker.  
Abb. 11 b. Aufgerichtete Großwallaby (Lithocranium Walleri). Nach Böcker. —  
Man beachte die jetzt statische Kurven.

**Vertebral column in special situations  
kangaroo in defence state, lumbar lordosis**



Abb. 10. Kängurui mit Lordosenbildung. Nach Böcker.

**Lift-grasp-climbing position  
neck and lumbar lordosis  
development of dome construction of vertebral spine**



Arch bridge construction  
changing to lattice tower construction

Abb. 12. Lordose (schematisch) beim Aufrichten im Zuge des Stemm-Greif-Kletterens.

**Lattice tower position**



a)



b)

- a) Human: lattice tower position
- b) Gorilla: lattice tower position, rest of vault bridge construction

**Homo erectus, lattice tower position  
dome function of the vertebrates**



Cervical lordosis  
thoracic kyphosis  
thoracic-lumbar lordosis  
fixed kyphosis of sacrum

"The design" of the human vertebral column is uncompleted, Koch 1964

## Special function of cervical spine turning movements in 3 dimensions Development of the Atlas-Axis-system

Three steps in development:

1. development of 2 condyles on os occipitale (amphibias),
2. development of the atlas-axis-joint, rebuilding of dens by loss of the first disc (tetrapods),
3. special axis-dens-system, great autonomy, highly vulnerable (man)

## Atlas, the titan giant „Who is carrying“

Son of Lapetos and of the okeanide Klymene

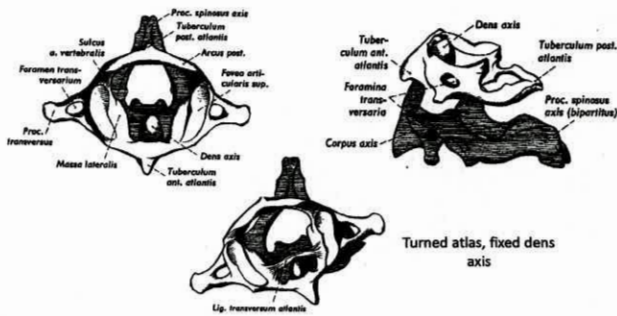


Carrying the globe

## Atlas-Axis-system, different positions

Atlas and Axis, cranial view

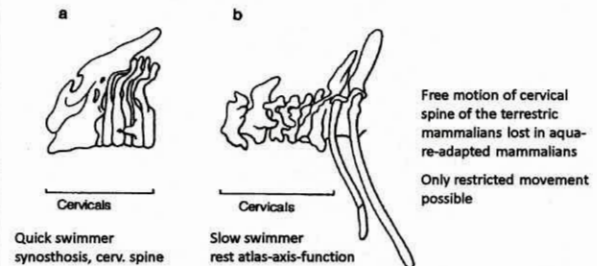
Atlas and Axis, view from dorsolateral



Turned atlas, fixed dens axis

## Dens-axis construction

Involution in the aqua re-adapted mammals



Free motion of cervical spine of the terrestrial mammals lost in aqua-re-adapted mammals  
Only restricted movement possible

Abb. 4 a, b. Seitliche Ansicht der HWS von a Delphinus delphis (schneller Hochseeschwimmer) b Platanista gangetica (langsamere Flußbewohner) (Nach Piller)

## Vulnerability of the human vertebral spine

incomplet development of lattice tower position,  
high vulnerability of axis-dens-system

- overloaded due to unphysiological position (industrial life), typical symptoms of cervical spine and lumbar region (Mumenthaler, Schliack)
- psychological factors, influencing regional dysfunction of vertebral spine, mainly upper part
- motion trauma of cervical spine (whiplash injury), mostly including the other parts of vertebral spine (typical acute symptoms, sometimes long-lasting dysfunction, sometimes defect states)

## Lattice tower position



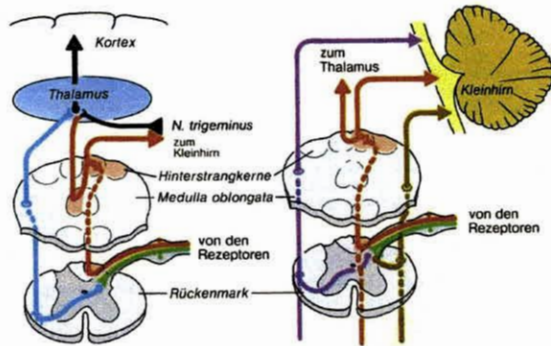
a)



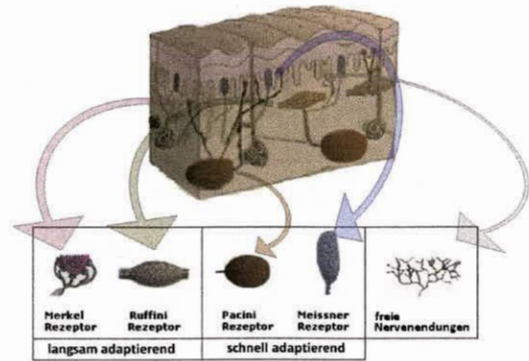
b)

- a) Human: lattice tower position
- b) Gorilla: lattice tower position, rest of vault bridge construction

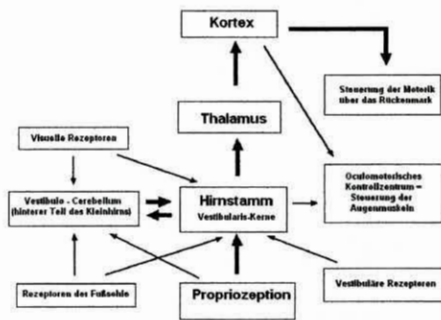
### Connection of the proprioceptive system to the cortex and to the cerebellum



### Receptors in foot sole



### Scheme of proprioceptive connections to the cortex



### Cervicogenic headache (tension headache) Symptomatology

- Pressure headache, from neck to occipital, mostly to the forehead, both sides, seldom one side,
- Helm-feeling, sometimes ring-shaped feeling
- Pressure feeling in the orbita
- Increase of headaches during coughing, unpleasant position of head and body, during fever state
- Starting possible due to external influence local cooling, trauma of vertebral spine, etc.
- Additional symptoms:
  - pain in C2 with dysesthesia
  - pseudo-trigeminal pain
  - atypical face pain

### Cervicogenic headache

- Neurological findings
  - Dysesthesia on scalp, one side, both sides
  - Dysesthesia in C2 (sometimes)
  - Dysesthesia in trigeminal area (sometimes) first branch or all branches, one side, both sides
  - Pressure pain occipital, one side, both sides
- Neuro-orthopaedic findings
  - blockage occipital/C1, C1/2
  - tensed region upper neck part
  - pressure pain paraspinal upper cervical spine
  - stretch-position of cervical spine
  - dysfunction of other vertebral spine

### Cervicogenic headache Differential diagnosis (I)

- Occipital neuralgia, (over diagnosed, Mumenthaler, 1970)
  - differentiation to cervicogenic headache clinically not possible
    - Insertiontendinosis of neck muscles
    - local zones of hyperalgesia
    - often disturbances of occipital joints
- Tension headache, real form
  - differentiation to vertebraogenic headache clinically not possible
  - diagnosis only acceptable:
    - no signs of cervico-occipital irritation
    - no signs of cervical irritation
    - no effect after special vertebral treatment
    - psychic irritation

### Cervicogenic headache Differential diagnosis (II) Vasomotoric headache

- Migraine cervicale (old terminology)
- Migraine (different forms)
- Cluster headache
  - Erythroprosopalgia = Horton neuralgia
  - Chronic paroxysmal Hemicrania (CPH)
  - Hemicrania continua (HC)
- Rare vasomotoric headache
  - Ice cream headache
  - coughing headache
  - Carotidodynia

### Upper cervical syndrome

- Combined symptoms
  - Cervicogenic headache
  - Cervicalgia
  - Migraine cervicale (old terminology)
  - Cervicogenic dizziness
    - attacks of vertigo, spontaneous or due to quick head movement
  - in addition:
    - middle and lower cervicale syndrome
    - cervico-dorsalgia, dorsalgia, lumbalgia
    - combination with pseudo-radicular symptoms

### Cervicogenic headache Examination program

- Neurological examination
- Manual examination, functional state of vertebral spine, especially cervical spine
- Examination of malstereotypias of body position and body movement
- X-ray of cervical spine with functional radiogram
- X-ray of the additional vertebral spine
- Cervical MRI

### X-ray cervical spine female patient, 47<sup>a</sup> diagnosis: cervicogenic headache



a) Retroflexion, blockage upper part, dysbalance occipito-atlanto-axial joint



b) Anteroflexion, blockage in upper part and lower part of cervical spine

### Cervical MRI female patient, 47<sup>a</sup> diagnosis: cervicogenic headache



Stretch-position of cervical spine, mostly upper part, multisegmental disc protrusion, incipient vertebrostenosis C5/C6

### Cervicogenic headache Therapy program

- Deblockage of blocked cervical spine motion segments, using manual therapeutic methods, mainly postisometric relaxation (Lewit)
- Physio-therapy program for correction of malposition and malstereotypias
- Physio-therapy program for correction of insufficient neck muscles and vertebragen muscles
- Local infiltration of tensed muscle areas, tendomyogelosis, etc.,
  - Xyloneural
  - "Tilscher scheme"
- Drug treatment
  - Muscle relaxantia, analgetica, etc.