THE RECONSTRUCTION OF SKULL BASE — HEALING AND PITFALL AND PEARLS DURING RECONSTRUCTION OF SKULL BASE

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The healing process is linked to the process of inflammation, as described by Robert Wirchow (1821-1902).

The study about histological, biomechanical quality of dura mater on the skull base, quality of different part of skull base, together with lamina cribrosa. From this study procceds the study of healling dura mater, including of skull base bone.The healing of skull base is affect with great numbers of factors – anatomical–embryonal, biomechanical, biophysical, chemical and biological. The work goals are determination of the dural quality of the skull base area under localisation and there are into anterior skull base fossa, which the most connected with paranasal spaces, the study of the most sensitivity area - lamina cribrosa.

Author of study reported in your works different type of reconstruction, different material from reconstruction and comments on 32 yy. Of experiences with those problems.

The border is formed by the chondrogenic bone and especially the dura mater, which is histologically formed mainly by collagen, a mixture of different types. The most important boundary between neurocranium and splanchnocranium is the dura mater. The problem of healing is based on this basis.

The ossification of the skull is important for healing too. The skull forms from two parts: desmogenic and chondrogenic. Desmogenic is skull vault and chondrogenic is skull base. The way of embryology development of skull have influence to healing. The chondrogenic part of skull have during healing problem (pure healing) with interposition of tissue (dura, brain, arterficial material etc.) into bone defect.

In order for healing to be as effective as possible, it is advisable to respect the basic principles of physical, chemical and biological.

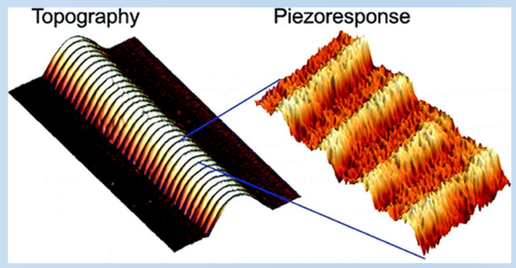
Physiological function of skull base

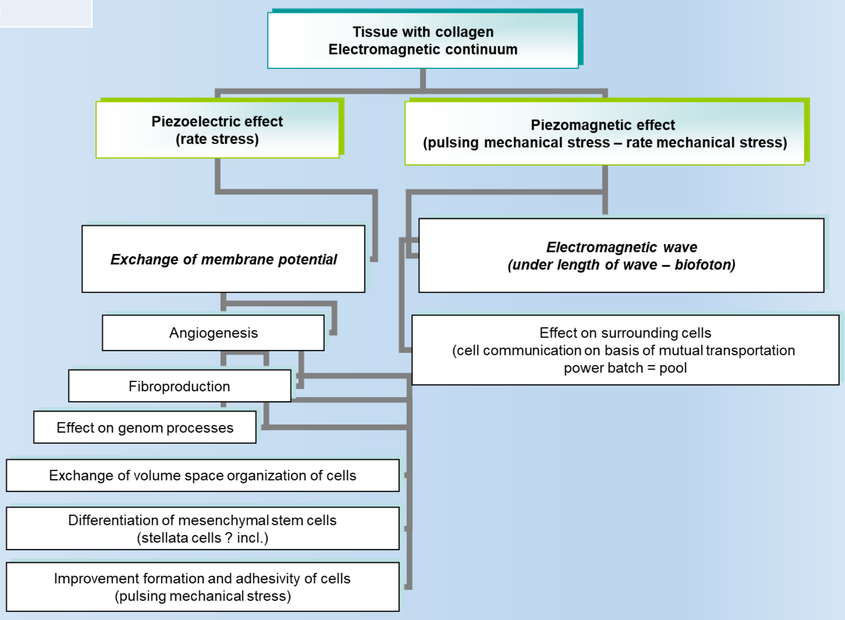
- **Static function** :
  - boder between neuro- and splachnocranium
  - protection of brain, vessels, nerves
  - fixation and sealing of vessels, nerves during penetration through skull base
- **Dynamic function** :
  - Biomechanic
  - Hemodynamic
  - Liquorodynamic
  - Lymphodynamic
  - Imunne and immunodynamic
  - Electromagnetic continnum – electrophysiology
  - Control homeodynamic function
  - *Note: excepting hypophyseos functions.*

The healing under mechanic stress

the intermitent compression or shear stress	the enchondral ossification
the traction stress	the intramembranous ossification
the constant compression stress (hydrostatic pressure)	the cartilago inhibit enchodral ossification
the high shear stress	the formation of fibrous tissue

The collagens are piezoelectric—left is topography of collagen molecul, right is piezoresponse





The type of collagen

The fibrillar collage – group I,II,IV,V (90% of collagen into organism – II chondroid tissue, III embryonic exchanges to I during maturation, IV- basal membrane, V wall of vessels)

The mesh collagen – group IV,VIII,X – C-NC domen - component of suprastructures

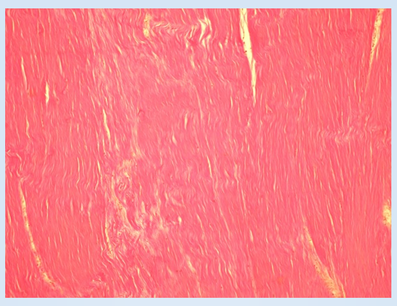
FACIT (fibril-associated collagen with interrupted triple helix) – group IX, XII, XIV, XVI, XIX, XX, XXI a XXII (collagen IX 3 α-chains, all of any only 1 α-chain) – shotter C-NC domen - only 30-75 residuum, fibrillar collagen 260 reziduum)

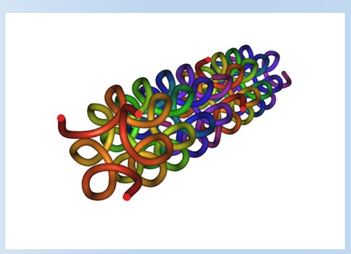
The transmembrane collagen – group XIII, XVII, XXIII, XXV nad any collagen similer proteins – macrophag´s receptor MARCO, α-chain N-NC domen - 3 subdomen – intracellular, trans-memebrane, extracellular, the extracelluler connecting domen - α- helical coiled-coil structure

Any collagens – group XV,XVIII, XXVI, XXVIII - only 1 α-chain with N-NC and C-NC domen

Triple helix – model of crystalic structure Pro-Pro-Gly 103

The histology of dura mater—the colorish van Giesen on collagen





Types of skull base reconstruction:

Endoscopic technique

Transcranial technique - extradural

- intradural

Basic surgery technic : „toast“ technic and „cuff“ technic

		Pitfall	Pearl
Pre OP		minimalized study for localisation of defects	precise study of defects localisation – CT, HRCT, MRI, MRI-cisternography, CT-cisternography, endoscopic diagnosis
		only basic biochemical study	bacterial, imnunological and biochemical energy study with study of proteinemie and albuminemia
OP		macrosurgery	presice revision of skull base – microscopically, endoscopically
		----	remove the interposits
		without removed mucosa	paranasal mucose totally removed in operative field, in frontal sinus closed frontonasal duct, cranialization sinuses
		one layer reconstruction	multilayer reconstruction
		non-vascularized material	minimally one vascularized layer (periosteal, galeal, omental, musculofascial, musculofascioasubcutaneous)
		free placed material	suture layers and tissue glue
	Osseous recontruction	into paranasal sinuses	autotransplant, hydroxyapatit, titanium mash, monomer, ioceramic, microplates, methylmethacrylate - no into paranasal sinuses, only above skull base toward intracranially
		-----	local antibiotical sponge course to paranasal sinuses
Post. OP		-----	antiobiotic under sensitivity of bacterial flora and local antibiotics
		when used lumbal drainage, but without regulation of pressure	intracranial pressure normal – non-high, non-lower; when used lumbal drainage with regulation of pressure in normal range (mechanical effect fot healing)
		horizontal position, vertical early position	postoperative body position – 30° upper part, vertisalisation after more than 5-7 days, but step by step
	Dietary	Hypoproteinemia, hypalbuminemia, catabolic state, immune disorder, collagen deficit	Hypernutrition, sufficient collagen in the diet and dietary supplements - hydrolysed collagen type I, III and curcumin, vitamin C, vitamin D3, amino acids glycine, proline and hydroxyproline, zinc, copper and sulphur Food: fish, orange, lemon, grapefruit and lime, eggs – proline, zinc sulphur, strawberries, raspberries, blueberries, cranberries or other tasty berries, bone broth – consommé, beans – collagen-forming amino acids and copper, poultry with skin, meat, crustaceans and molluscs – collagen-forming amino acids and zinc and copper peptid thymosin beta

Author study this problem under this factors (anatomical–embryonal, biomechanical, biophysical, chemical and biological) long time and ruminate over individual influences on healing of skull base on foundation personal experiences 32yy. with reconstructions of skull base after trauma and the others skull base surgeries. He anatomizes those factors on basis of anatomical-embryonal, biomechanical, biophysical, biological studies too.

In this study there is advented on biomechanical nad biophysical quality of collagen and those influences on the healing (piesoelectric, pieromagnetic effect etc.).

The goal of study is refered to pittfalls et pearls during surgery reconstructions of skull base a to influences, which have be invoved in quality of healing of skull base. He specify some methods from biomechanical a physiological study.

The conclusion of the healing study is shown in the table above.

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