Research Posters

R001

Angiogenesis in External Auditory Canal Cholesteatoma (EACC)

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Problem: The cause of EACC is still unclear. The role of angiogenesis during the genesis of EACC is surprisingly under-evaluated. In this study we studied the expression of the angiogenic factors HGF/SF, its c-Met receptor, VEGF and FGF2 and their contribution to the genesis of the EACC. Staining against von Willebrand Factor was used to analyze the location of angiogenesis in EACC.

Methods: 13 EACC specimens were collected from 13 patients undergoing ear surgery. The tissue samples were evaluated by means of immunohistochemistry for angiogenic factors. The degree of staining was evaluated semi-quantitatively.

Results: vWF could be detected in the apical layers of the EACC-perimatrix epithelium suggesting angiogenesis in this part. All layers were positive against FGF2; however, adjacent tissue did not express FGF2. HGF/SF was detected predominantly in the adjacent stromal tissue (especially fibroblasts). VEGF and c-Met were positive in all layers of the perimatrix epithelium, especially in the proliferating area of the EACC.

Conclusion: In summary, genesis of the EACC seems to be multifactorial. The increased expression of the angiogenic factors HGF/SF, its c-Met receptor, VEGF and FGF2 are evident, and they seem to play an important role during the genesis of the EACC.

Significance: The anti-angiogenic therapy of EACC should be discussed.

Support: None reported.

R002

Mitomycin-C in the Post-Surgical Ear Canal

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Problem: To evaluate the use of topical mitomycin-C (MMC) in the prevention of scar tissue formation in the post-surgical ear canal after canalplasty, tympanomastoidectomy, or lateral temporal bone resection.

Methods: Prospective pilot study at a tertiary-care academic center. Six patients with evidence of recurrent postoperative granulation tissue were included; 3 patients underwent canalplasty and split thickness skin grafting for external auditory canal stenosis, 2 patients underwent tympanomastoidectomy for resection of cholesteatoma, and 1 patient underwent lateral temporal bone resection for squamous cell

carcinoma of the external auditory canal. Mitomycin-C (0.5 mg/mL) was applied topically for 5 minutes to the epithelialized post-surgical external auditory canal/mastoid cavity in patients with evidence of recurrent granulation tissue formation despite prior postoperative debridement or silver nitrate cauterization procedures. In two cases, a repeat application of MMC was used due to recurrence of scarring.

Results: Outcomes were measured at initial MMC application and 1 and 3 months thereafter using a visual analog score (VAS) based upon the degree of EAC occlusion by granulation tissue. Need for debridement of recurrent granulation tissue on follow-up was noted. Three patients (50%) had improved VAS 1 month after treatment. Two patients (33%) had improved VAS at 3 months. Five (83%) required at least one debridement procedure despite MMC application.

Conclusion: Postoperative topical application of MMC was not effective at this dose in preventing scar tissue formation in the postoperative epithelialized ear canal.

Significance: Recurrence of granulation tissue in the post-surgical ear canal remains a challenge. Silver nitrate cauterization and debridement of granulation tissue continue to be standard forms of its management.

Support: None reported.

R003

Measurement of In Vivo Human Tympanic Membrane by MR Imaging

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Problem: The morphology and histology of tympanic membrane (TM) have been reported. However, the functions and dynamic characteristics of in vivo human TM remain unclear. Hence, the objective of this study was to noninvasively measure the dimensional characteristics of in vivo human TM by MR imaging and to further analyze its mechanical properties.

Methods: All experiments were performed on a 3-T MR system (Brucker S630) using a surface coil of 9-cm diameter. Multi-slice-single-echo (MSSE) imaging and 3D SNAP sequences were utilized with the imaging plane in coronal direction. Imaging parameters for MSSE were TR/TE = 1480/40 ms, field of view (FOV) = 130 mm × 130 mm, acquisition matrix = 512 × 512, slice thickness = 2.2 mm, and for 3D SANP were TR/TE = 12.5/5.0 ms, FOV = 150 mm × 80 mm × 30 mm, acquisition matrix = 256 × 128 × 64, flip angle = 20 degrees.

Results: The pixel resolution of the acquired MR image for the volunteer's right ear and the scan time were 0.25 mm, 0.25 mm and 9 minutes 36 seconds by MSSE and 0.59 mm, 0.63 mm, 0.47 mm, and 1 minute 42 seconds by 3D SNAP for fast imaging. A 3D solid model of TM, semicircular canals, and cochlea was then reconstructed based on the acquired images. The surface area and volume of TM, semicircular canals, and cochlea were subsequently determined as 108.34, 352.50, and 168.91 mm² and 36.47, 98.05, and 41.08 mm³, respectively. Variabilities of dimensional characteristics of TM between volunteers were further analyzed.

Conclusion: The dimensional characteristics of in vivo human TM were successfully quantified by MR imaging using MSSE and 3D SNAP sequences. The images of TM can be obtained by MSSE sequence for high spatial resolution with longer scan time or by 3D SNAP sequence for low spatial resolution with shorter scan time. Using the proposed measurement method, the spatial configuration of the in vivo TM can be tracked in pre- and post-operation, and the geometric characteristics can be determined noninvasively.

Significance: Ear.

Support: None reported.

R004

Antibacterial Properties of Residue Formed from Cipro HC

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Problem: Otopical medications are used to treat numerous diseases that affect the external and middle ear. Certain formulations of these medications leave a residue in the external ear. It is unclear whether this residue has any antibacterial properties or is merely a messy nuisance.

Methods: Cipro HC (Alcon) otopical medication was used in the experiment. This medication was recently reformulated to reduce the amount of residue that is formed. This was an in vitro study which tested the antibacterial properties of the medication in solution form and in residue form in the older and newer formulations. A control of ciprofloxacin disk was used. Cultures tested were *Pseudomonas aeruginosa* and *Staphylococcus aureus*.

Results: The antibacterial properties of the solution and residue were comparable in zone of inhibition. Both the residue and the solution had larger zones of inhibition compared to control. The older formulation of Cipro HC required a longer time to form residue and was thinner than the newer formulation. Both formulations had equal antibacterial properties.

Conclusion: Many disease processes are treated with ototopical medications, which usually leave a residue. Some pharmaceutical companies have reformulated these medications in order to reduce the amount of residue formed. This study shows that the residue does have antibacterial properties and may serve an important role in the treatment of the disease.

Significance: This study demonstrates that the residue formed from ototopical medications may serve an important antibacterial role in the treatment and should not be eliminated from the formulation of the product. Further in vivo studies are being performed.

Support: None reported.

R005

Co-culture of Mucosal/Mesenchymal Stem Cells on Hydroxyapatite for Regeneration of Mastoid

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Problem: Mastoid air cells have a unique structural feature and physiological functions, namely, the gas exchange, the material secretion, and the waste excretion. Once these functions failed, intractable otitis media would be prolonged. The final aim of this study is to regenerate the physiologic functions of the mastoid air cells. In this experiment, it was examined whether the cultured cells would be able to grow on the surface of an artificial honeycomb-like bone in vitro.

Methods: Two types of 3-dimensional hydroxyapatite (3D-HA) of honeycomb-like structure were used as artificial pneumatic bones. One type of 3D-HA had a high ratio of micropore, while the other had it in low ratio. Moreover, the former type was divided into two models with or without its surface coated with collagen. Cultured mucosal cells and mesenchymal stem cells were harvested from the canine oral floor and the canine femoris, respectively. These cells were cultured on the surface of 3D-HA and the proliferation ratios were compared.

Results: The ratio of micropore of 3D-HA did not influence the proliferation of cultured cells. However, the proliferation of cells was observed in the collagen-coated model much better than in the non-coated model. The best combination was co-culture of mucosal cells and mesenchymal stem cells in the collagen-coated model.

Conclusion: This in vitro study indicated that cultured cells could grow on the surface of the artificial 3D-HA.

Significance: This tissue engineering method is a possible treatment for intractable otitis media.

Support: None reported.

R006

Ultrastructure of the Basilar Membrane in Chinchilla Cochlea

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Problem: The objective of this study was to determine the molecular composition and ultrastructure of extracellular matrix in the mammalian basilar membrane.