Endoscopic approach to middle ear problems
Evolution of the otoendoscopy in the middle ear surgery:
From an additional to a primary procedure

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Overview of the Issue
Interventional otoscopy allows new specific diagnostic and treatment options and a reduction of invasive conventional surgical procedures. Advanced diagnostic imaging like computed tomography in combination with modern videoscopic equipment expands the field of indications for minimal invasive procedures in the ear.

The medial part of the external auditory canal, the tympanic membrane and the tympanic cavity including its opening into the nasopharynx can be assessed easily with appropriate rigid endoscopes. Modern video-otoscopy in combination with interventional techniques allows very precise specimen collection and biopsies as well as minimal invasive surgery within an area that was not easily accessible so far.

Diagnostic procedures
1. Examination of the medial part of the external auditory canal, the lateral surface of tympanic membrane. The latter is translucent and may allow a visual impression of the mesotympanum.
2. After tympanocentesis or in cases with perforated tympanic membrane it is possible to examine dorsally: the epitympanum (epitympanic recess) with the auditory ossicles, medially: the mesotympanum with tympanic membrane and the opening of the auditory tube that connects to the nasopharynx and ventrally: the hypotympanum with the mucosa of the tympanic bulla. In the literature a classification solely between cavum tympani proper and epitympanic recess is also described.

Therapeutic procedures
1. Specimen collection and flushing in infectious and inflammatory diseases of the middle ear,
2. Inflammatory polyps of the bulla in cats, extraction and subsequent "cleaning" of the tympanic bulla.
3. Neoplastic diseases, exploratory excision

We use the following equipment
1. In small animals there is an extraordinary wide range of anatomic diversity in size and shape between the different breeds. Correspondingly a wide variety of equipment can be necessary for interventional procedures.
2. Rigid endoscopes with a diameter between 1.9 and 2.7 mm and a view from 0° to 70° for the ear and 120° for the nasopharynx, with and without shaft.
3. Rigid and flexible suction and flushing pipes, cannulas and catheters from 0.8 to 2.5 mm
4. Various biopsy and grasping forcepses
5. Special extensions for HF-surgery and laser applications

Practical approach
If involvement of the middle ear is suspected, a computed tomographic examination prior to endoscopy is very beneficial and helps to assess extension and quality of the disease process.

A retrograde pharyngoscopy should always be performed prior to otoscopy to assess the nasopharyngeal opening of the auditory tube for any signs of discharge.

If there is no clear view of the tympanic membrane the external ear canal is cleaned by a combination of cautious suction and flushing. Squalen may be used as ceruminolytic agent.
Two principally different working methods are
  Working THROUGH the channel of the endoscope shaft with suction and forceps or
  Working PARALLEL to the endoscope with various devices
  A combination of both is also possible
The "parallel-to-endoscope-technique" has several advantages:
  1. allows acting without shaft thus gaining considerably more space in the depth of the
  operating field
  2. working with two separate angles (i.e. endoscope and forceps) allows much better
  manipulation of tissue
Disadvantage of this technique:
  1. needs definitely more manual skill and training
  2. thin endoscopes without the protection of a shaft are more prone to damage because of a
  low buckling strength
Tympanotomy: An 18G flexible IV catheter is best used for specimen collection in case of secretion
within the tympanic bulla. Positive collection can be visualized through the transparent catheter.
Tympanotomy should, if possible, be performed without prior flushing of the ear canal because
flushing agents may disturb cytologic examination. Specimen can be examined bacteriologically,
cytological and pathohistologically if indicated.
Sometimes, secretion is too viscous to be collected through this catheter. In such cases, collection
 can be tried through a larger bore metal suction pipe. If necessary, material inside the bulla can be
mobilized by a combination of flushing and suctioning with a small metal cannula. Blunt trauma of
the tympanic membrane will usually heal within two weeks, if no infection is present.
Polyps can be resected with a traction-method with forcepses. Goal should be a tympanic wall
 cleared of all granulation tissue. In cases the second compartment of the tympanic bulla is filled with
polypous tissue as well, the septum bullae can be driven through. Rarely, a VBO will be necessary if
care is taken to remove all granulomatous tissue. Bleeding usually terminates as soon as all
granulomatous tissue is removed. Always owners should be informed about the possibility of
Horner's syndrome upfront.
Polyps growing through the auditory tube into the nasopharynx can be best removed under
retrograde endoscopic control.
Flushing/Irrigation: In case of otitis media or interna, the middle ear can be flushed with attenuated
antibiotic solution. Patency of the auditory tube can be checked with simultaneous retrograde
pharyngoscopy.