Olfactory disorders – work-up, typical findings and therapy

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Prevalence smell disorders

- 5% anosmic > 45 years
- 15% hyposmic
  (Brämerson et al., Laryngoscope 2004; Landis et al., Laryngoscope 2004)
- age > 70 y: 30% anosmic
  (Ozy et al., Science 1984)

Smell test necessary?

Self assessment of olfactory function: very poor!

Olfactory testing mandatory!
Screening – Test

Screening test: fast, reliable, high sensitivity

12 - Item Screening Test
Sniffin’ Sticks Test 1 of 4 (25%)

8 - Item Screening Test
Smell Diskettes 1 of 3 (33%)

Screening Test 6 - Items

Psychophysical Smell Tests

Screening Test - 12 Items

Psychophysical Smell Tests

threshold + identification or discrimination
reliable and validated!
Psychophysical Tests

Threshold:
concentration where 50% of stimuli are detected
(no episodic or semantic memory used, low cognitive burden)

**Suprathreshold tests:**
Discrimination: non verbal ability to differentiate between odors
Identification: verbal test, recognition and communication of its correct identity
correlate with subjects’ executive function and episodic memory

Psychophysical tests

- **UPSIT**
  University of Pennsylvania Smell Identification Test

- **Sniffin’Sticks**
  Threshold Discrimination Identification

Sniffin’Sticks test results

<table>
<thead>
<tr>
<th>Score</th>
<th>anosmia</th>
<th>hyposmia</th>
<th>normosmia</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDI - score</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>anosmia: 0 - 15</td>
<td></td>
<td></td>
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<tr>
<td>hyposmia: 16 - 30</td>
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<tr>
<td>normosmia: 30 - 48</td>
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</table>

Retronasal testing

ortho- and retronasal perception differ

Clinical Assessment of Retronasal Olfactory Function

Sommerschule 2018, Prof. Antje Welge-Lüssen
Retronasal testing

Retronasal testing of olfactory function: an investigation and comparison in seven countries

Dane Cevi, Holte Hoffmann, Carl Plathet, Filippos Karatza - Antje Welge-Lüssen, Jan Calkins - Insitute for Laryngology - Eduard Heiron - Thomas Hansem

2010

Fig. 3: Frequency of retinal testing in patients with anosmia (N = 90), hyposmia (N = 136), and normal controls (N = 252)

uni vs. bilateral?

Olfactory testing in clinical settings - is there additional benefit from unilateral testing?

Antje Welge-Lüssen1, Veitze Gudrun2, Marit Wolkenberger3, Thomas Hennino4

23.4% of 518 patients: difference of > 6 points

Recording of evoked potentials (OEP)

Olfactometer

Picture of potential

olfactory evoked potential
Posttraumatic anosmia

CO2 | H2S | Vanillin

Evoked potentials

medicolegal questions

Classification in clinical set-ups

Sinonasal Disorders

Olfactory disorders caused by pathology within the nose or paranasal sinuses

diagnosis
- history
- clinical examination (nasal endoscopy)
- psychophysical smell tests
- imaging (computed tomography / magnetic resonance imaging)

CO2 H2S Vanillin

left right

0 2048 ms

Survey in ENT Hospitals (n=70) in Germany, in (n=20) Austria and (n=12) in Switzerland

Damm et al, 2004

Chen et al, 2013

Nordin et Brämerson 2008

Diagnosis - history - clinical examination (nasal endoscopy) - psychophysical smell tests - imaging (computed tomography / magnetic resonance imaging)

Damm et al, 2004

Sinonasal Disorders

Olfactory disorders caused by pathology within the nose or paranasal sinuses

diagnosis
- history
- clinical examination (nasal endoscopy)
- psychophysical smell tests
- imaging (computed tomography / magnetic resonance imaging)
Olfactory function in CRS

Polyposis: strongest predictor for a poor olfactory function

Sensorineural lesion in OE

Therapy – topical steroids

Therapy – allergic rhinitis
Systemic steroids

Treatment of smell loss with systemic methylprednisolone

n=425
Methylprednisolone, 40 mg, decreasing 5 mg every second day (350mg)

Schneuer et al., 2012

Therapy – systemic steroids

Olfactory outcomes in chronic rhinosinusitis with nasal polyposis after medical treatments: a systematic review and meta-analysis.

Schneuer et al., 2012

Cave: side effects of steroids

Osteonecrosis Following Short-term, Low-dose Oral Corticosteroids: A Population-based Study of 24 Million Patients

MATTHIAS E. ORFALI, MD

Incidence: never: 0.083%
once: 0.13%
twice: 0.23%

Surgical therapy

Rationale:

Removal of polyps reduces inflammation ↓ improvement of ventilation

small function improves
### Data …conflicting

<table>
<thead>
<tr>
<th>Author</th>
<th>postoperative olfactory deterioration (%)</th>
<th>postoperative improvement (%)</th>
<th>postoperative change in the worse (%)</th>
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</thead>
<tbody>
<tr>
<td>Pade et al. (2008)</td>
<td>15</td>
<td>70</td>
<td>6</td>
</tr>
<tr>
<td>Delank et al. (2003)</td>
<td>36</td>
<td>36</td>
<td>0</td>
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<tr>
<td>Downey et al. (2008)</td>
<td>41</td>
<td>67.3</td>
<td>0</td>
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<tr>
<td>Kimmelman et al. (2010)</td>
<td>20 (n=7)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jiang et al. (2009)</td>
<td>70</td>
<td>10</td>
<td>35</td>
</tr>
<tr>
<td>Wiggard (1999)</td>
<td>40 (n=4)</td>
<td>54.9</td>
<td>6.5</td>
</tr>
<tr>
<td>Tutu et al. (1999)</td>
<td>35</td>
<td>35</td>
<td>35</td>
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</table>

### Histology as predictor?

Allergic rhinitis and aspirin-exacerbated respiratory disease as predictors of the olfactory outcome after endoscopic sinus surgery

Ethmoid Histopathology Does Not Predict Olfactory Outcomes after Endoscopic Sinus Surgery

Olfactory function following nasal surgery: a 1-year follow-up

Can Surgeons Predict the Olfactory Outcomes After Endoscopic Surgery for Nasal Polyposis?

Histologic findings do not allow us to predict postoperative olfactory outcome!

### Postoperative outcome

**Olfactory Function Following Nasal Surgery**

Sniffin’ Sticks
n= 387 pre-op.
n= 206, 4 months postop.

### Computertomography as predictor

A = 0 %
B = < 25%
C = 25-50%
D = 50-75%
E > 75%
**Surgical vs. conservative therapy**

Surgical versus medical interventions for chronic rhinosinusitis with nasal polyps.

- **Surgical vs. conservative therapy**
- **Patient with smelling disorder II...**
- **Postinfectious smell disorders**
- **Postinfectious disorders**
- **Incidence 11-42 %, women > men, 40 – 70 years**
- **Close temporal relation**
- **Parainfluenza vs. Rhinovirus ?**
- **Epithelial lesions**
- **Wang et al., Suzuki et al., 2007**
- **Yamagishi et al., 1994**
- **Jafek et al., 2002**
- **Wang et al., Suzuki et al., 2007**
- **Postinfectious disorders**
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- **Yamagishi et al., 1994**
- **Jafek et al., 2002**
- **20.08.2018**
- **Sommerschule 2018, Prof. Antje Welge-Lüssen**
Prognosis… and therapy

Spontaneous recovery
32 % - 66 % (Reden et al, 2006; Duncan et al, 1995)

Co-factors
- age (improvement): < 40 y: 47%; > 70 y: 7%
- duration of disorder

therapeutic options?

Smell training

**Odorant Stimulation Enhances Survival of Olfactory Sensory Neurons via MAPK and CREB**

Watt et al. Neuron, 2004

140 patients, postinfectious disorder

- 4 strong odors, 16 weeks
- 4 weak odors, 16 weeks

Smell training

140 patients, postinfectious disorder

- high training group: 15 / 24 (63%)
- low training group: 6 / 31 (19%)

Damm et al., 2013

Watt et al., Neuron, 2004

Smell training

**Smell Training**

Modified Olfactory Training in Patients With Postinfectious Olfactory Loss

Altunbas et al., Laryngoscope 2015

- Influences olfactory bulb volume
- and connectivity

Negoias et al., 2016

Kollndorfer et al., 2015

conventional training vs. modified training vs. controls
Smell Training

Effects of olfactory training: a meta-analysis

Table 1. Summary of the studies included in the meta-analysis of olfactory training outcomes.

<table>
<thead>
<tr>
<th>Study</th>
<th>Condition</th>
<th>Control</th>
<th>Difference</th>
<th>Effect Size</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorokowska et al.</td>
<td>Smell training</td>
<td>Placebo</td>
<td>23%</td>
<td>37%</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Sorokowska et al., Rhinology 2017

Vitamin A

Intranasal vitamin A is beneficial in patients with post-infectious olfactory loss: a retrospective cohort analysis of 170 patients

n = 46
n = 124

Vitamin A

postinfectious smell disorders (n=102)
significant difference!

Hummel et al., submitted

Acupuncture

Effects of traditional Chinese acupuncture in post-viral olfactory dysfunction

15 patients postinfectious smell disorder (mean duration 4 J.)
acupuncture vs. vit. B treatment

Vent et al., 2010

Sniffin Sticks Oral Vit B. complex 1x/d for 12 weeks

1x/week acupuncture 30 minutes for period of 10 weeks

Sniffin Sticks

Acupuncture

60 patients postinfectious smell disorder
2x/ week for 6 weeks acupuncture vs. placebo-acupuncture

p=0.001
p=0.13

Vent et al., 2010

Cuevas et al., to be published
Posttraumatic smell disorders

Definition:
Disorder in close temporal relationship to trauma
with increasing trauma severity
(severity of trauma, duration of unconsciousness): Incidence

Pathophysiology
(intranasal scarring, tearing of fila olfactoria, intracranial lesions)

Posttraumatic disorders

spontaneous recovery: 10 – 35% after 2 years
(Riedel et al, 2000; Doty et al, 1997; Costanzo et Becker, 1998)
improvement up to 6 years
(Welge-Lüssen et al, 2011)

scarring very likely
not yet visible

indirect signs:
biopsy of OE
volume of OB
(Jaffe et al, 02; Müller et al, 05)

Dexamethason in high dose prevents scarring
**Steroids in humans**

Steroid treatment of posttraumatic anosmia  

\( n = 116, \) highdose peroral steroids  
\( (60\text{mg }/\text{3d}; 40\text{mg }/\text{3d}; 30\text{mg }/\text{3d}; 10\text{mg }/\text{3d}) \)  

after 3 months  

19 patients improved (16.4%)  
- Intervall trauma – therapy: 1-53 mts (median: 10 Mt.)  
- spontaneous recovery (no control group)

**Zinc - posttraumatic**

145 Pat, posttraumatic, 4 groups (\( n=35-39 \))  

- Zinglucronat 30mg/d  
- steroids (1mg/kg KG)  
- nihil

**Volume olfactory bulb**

Prognostic Value of Olfactory Bulb  
Volume Measurement for Recovery in  
Postinfectious and Posttraumatic  
Olfactory Loss

Changes in olfactory function: measurement of olfactory bulb volume:  
higher volume: improvement more likely

**Loss of smell**

if sudden…  
- high impact on quality of life  
- subjective disturbance high  
- quality of life reduced:  
  - lack of body odor  
  - loss of joy in eating / loss of appetite  
  - gain or loss in weight  
  - depression
Summary

- Olfactory disorders are common
- Meticulous History:
  - Time course / medication / allergies / concomitant diseases / operations / family history?
- Self-assessment unreliable – testing mandatory
- Imaging
  - depending on your assumption: CT / MRT or both

Summary

- Therapy in postinfectious / posttraumatic disorders: smell training, Vit A drops
- Sinonasal disorders: topical & systemic steroids, 
  - operative therapy ??
- additional examinations
- Counseling