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ORIGINAL STUDY

Dysosmia – measured by the target olfactogram

C.F. Claussen, U. Fraas, E. Claussen
Neurootology, ENT Clinic, University of Wurzburg, Germany
Neurootological Research Institute 4-G-F, Bad Kissingen, Germany

ABSTRACT

BACKGROUND. The sense of olfaction detects and identifies airborne chemicals. The sense of smell can be impaired on one or both sides in cases of common cold or atrophy of the nose mucus membrane. The sense of smell may be lost when the nerve filaments of the nose are due to head trauma or the nerve has been damaged by skull tumors.
MATERIAL AND METHODS. For clinical purpose we designed the target olfactogram 20 years ago. It is a supraliminar monorhinal sniffle test using representative chemical substances for the 9 groups of basic odours. Each of the 12 partial smell tests is related to a 30° segment of the olfactogram. After each sniffle, the patient is requested to grade his sensation according to a scale with 6 scores from descriptive identification (1) over an emotional scheme with good (2), indifferent (3), bad (4) to unspecific borderline (5) and no response (6). The target olfactogram is completed before and after decongestion of the nasal cavities.
RESULTS. Due to the broad spectrum of substances applied, the test exhibits a broad variety of test patterns. The keyhole pattern is typical for complete anosmia and the center point for nasal anesthesia. However, incomplete anosmias, hyposmias and parosmias are more frequent.
CONCLUSION. The results can be quickly used in the files and clinical rounds. In posttraumatic smell disorders or other follow-ups, the development of the disease can be successfully monitored. The test chart allows differentiating between the various groups of the above mentioned smell deficiencies.
KEYWORDS: dysosmia, anosmia, hyposmia, olfactogram, target olfactogram

INTRODUCTION

The sense of olfaction detects and identifies airborne chemicals. The olfactory sensorial epithelium in the upper choanal airways serves for chemoreception.

The sense of smell can be impaired on one or both sides in cases of common cold or atrophy of the nose mucus membrane. The sense of smell may be lost when the nerve filaments of the nose are due to head trauma or the nerve has been damaged by skull tumors[1,2]. Hallucination of smell accompanied by the "déjà-vu" sensation of strange familiarity, transient confusion or convulsions (hippocampal fits) may occur in association with tumors or other lesions in the olfactory centers of the brain temporal lobe. In many cases, vascular disturbances of the inferior cerebellar artery lead to distortions of smell or partial anosmias. The normal state of sense of smell is called "euosmia". Hyposmia defines a diminished sensitivity of smell.

Absence of the sense of smell is called anosmia. Also, the termini "anosphrasia" and "olfactory anesthesia" are used. However, olfactory anesthesia must not be mixed with nasal anesthesia where, besides the loss of the sense of smell, the trigeminal sensations are also lost. "Anosmia gustatoria" is the loss of the power to smell foods. The term "preferential anosmia" expresses the lack of ability to sense certain odours only; in this respect, we also use the expression "partial anosmia". The loss of smell due to nasal obstruction is called "anosmia respiratoria". "Allotriosmia" or "heterosmia" is a perverted condition of the sense of smell, which means that strange or foreign sensations are associated with typical smells. The term "parosmia" expresses any disease or perversion of the sense of smell.

THE TARGET OLFACTOGRAM

Among 10,335 neurootological patients of our nuerootological data bank NODEC IV, we had 3% anosmias, 2.8% hyposmias and 0.4% parosmias needing a diagnostic

Corresponding author: Prof. C.F. Claussen, Extraordinarius fur Neurootologie, Kurhausstr. 12, 97688 Bad Kissingen, Germany
email: claussensolog@t-online.de

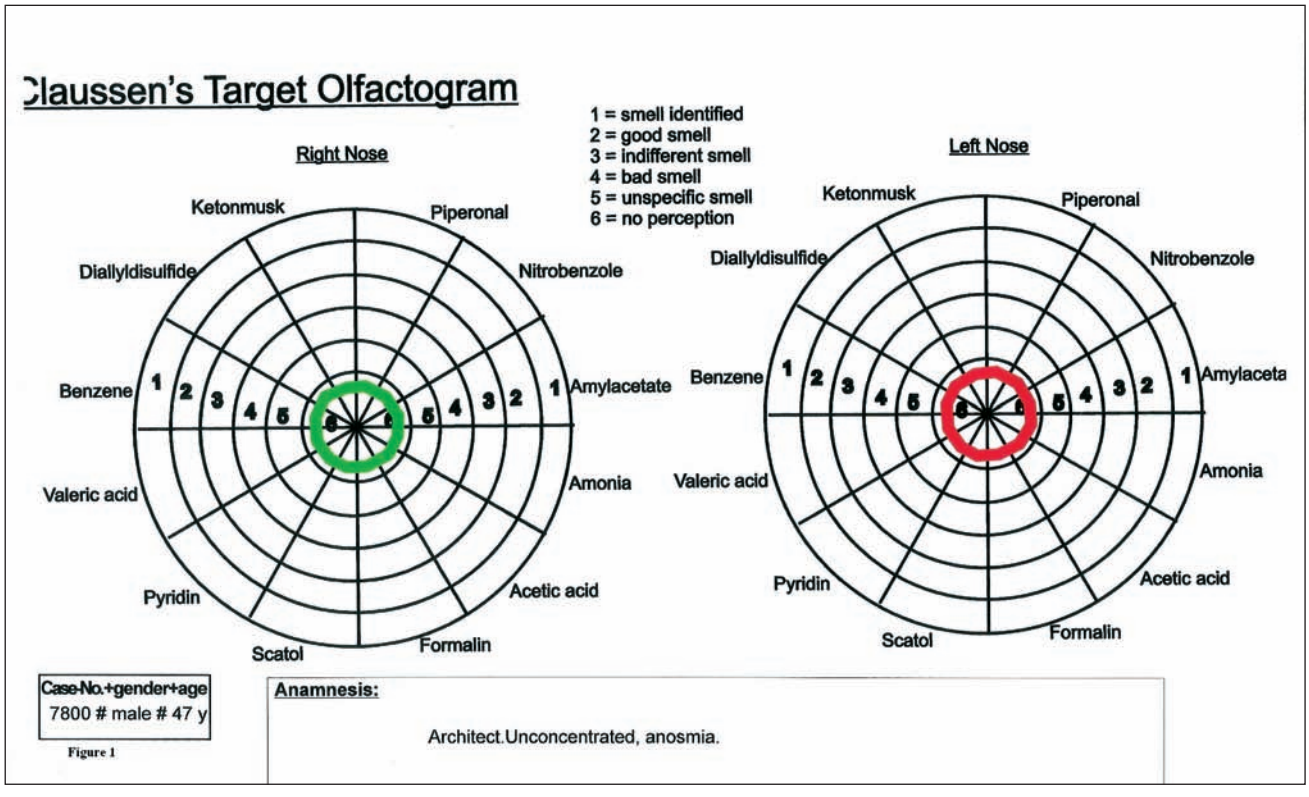

Figure 1

classification and a systematic therapy. For clinical purpose, we designed the target olfactogram 20 years ago. It is a supraliminar monorhinal sniffle test using representative chemical substances for the 9 groups of basic odours of Zwaardemaker[3,4]. The 3 proteins irritating the trigeminal nerve are formaldehyde, acetic acid and liquid ammonia. The resulting chart is built of a polar coordinate net of the type of a practice target. Therefore, this test is called the "target olfactogram". Each of the 12 partial smell tests is related to a 30° segment of the olfactogram. After each sniffle, the patient is requested to grade his sensation according to a scale with 6 scores from descriptive identification (1) over an emotional scheme with good (2), indifferent (3), bad (4) to unspecific borderline (5) and no response (6). The target olfactogram is mostly completed before and after decongestion of the nasal cavities.

Due to the broad spectrum of substances applied, the test exhibits a broad variety of test patterns. The keyhole pattern is typical for complete anosmia and the center point for nasal anesthesia. Both are rare findings. However, incomplete anosmias, hyposmias and parosmias are more frequent. Their statistical relation to typical underlying diseases and degenerative states is described.

The target olfactogram is called according to its typical pattern like a shooter's practice target. It is a polar coordinate system, containing in its angular orientation 9 olfactory test substances plus 3 trigeminal test substances. The circular orientation contains a Gnostic score of marking the level of perception for each substance applied.

In a gross differentiation, the smell substances are psychophysically classified according to von Haller[5,6] as:

- Odores suaveolentes - pleasant odours
- Odores medii - indifferent odours
- Foetores - unpleasant odours
- The fourth major category contains the trigeminal irritating substances.

Each of these 4 major classes are subdivided into 3 special qualities, which then amount to 9 basic odours according to Zwaardemaker (1895)[7]. The group of trigeminal irritating substances contains an aldehyde, an acid and a caustic solution. Thus, the test stimuli are grouped in the following order:

1. Odores suaveolentes:

a. etheric smells; b. aromatic smells; c. balsamic smells

2. Odores medii:

a. amber-musk smells; b. allyl-cacodyl smells; c. burning smells

3. Foetores:

a. caprylic smells; b. repugnant smells; c. phoetyde smells

4. Trigeminal stimuli are:

a. aldehyde; b. acid; c. caustic solution.

For synoptic clinical purpose, the test results are charted in a 2-dimensional polar coordinate system look-

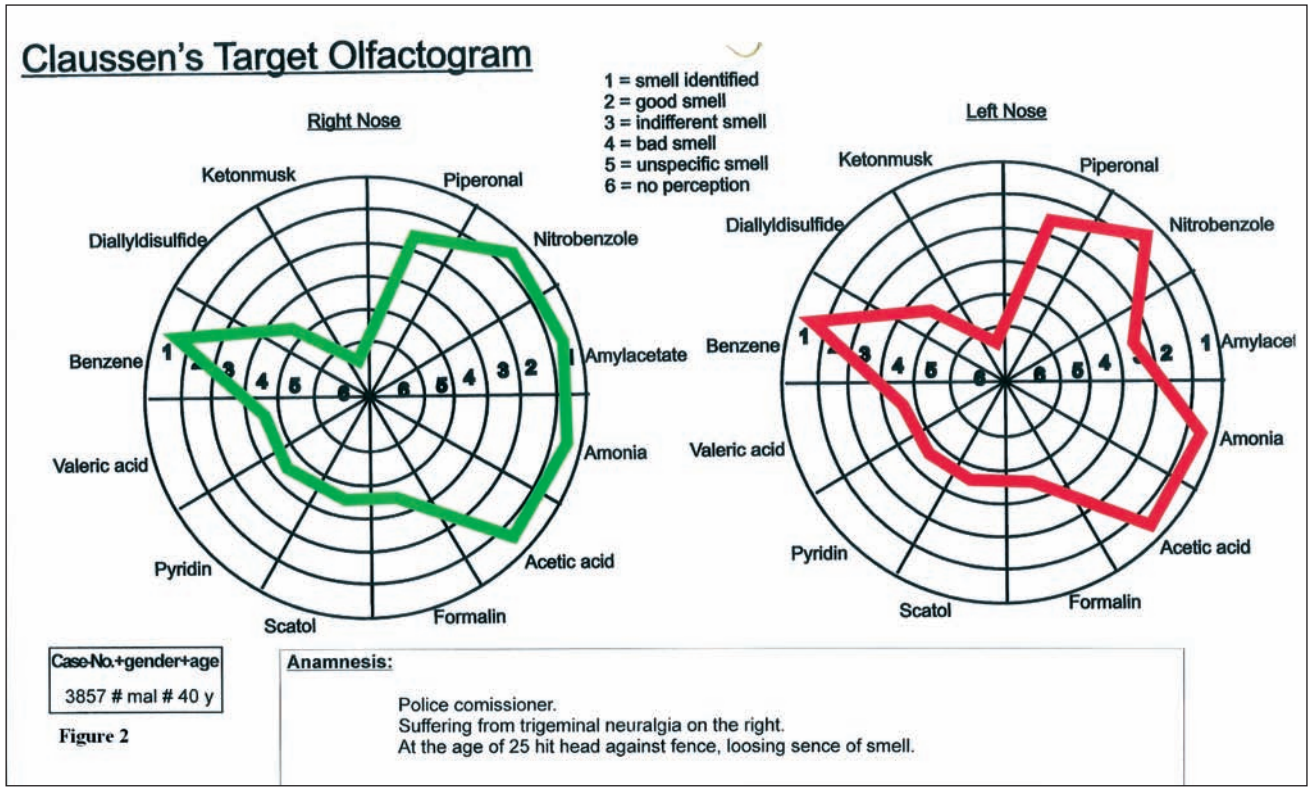

Figure 2

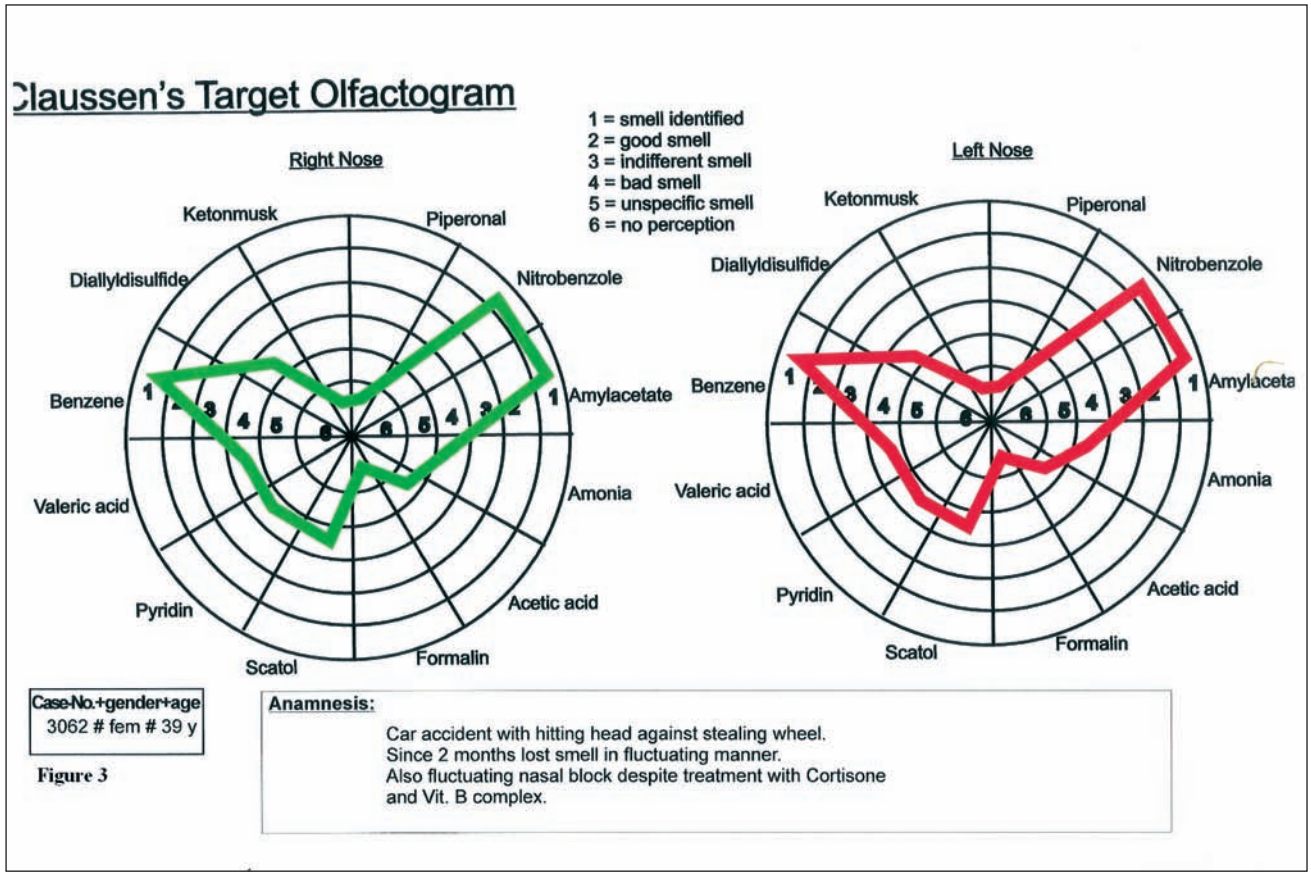

Figure 3

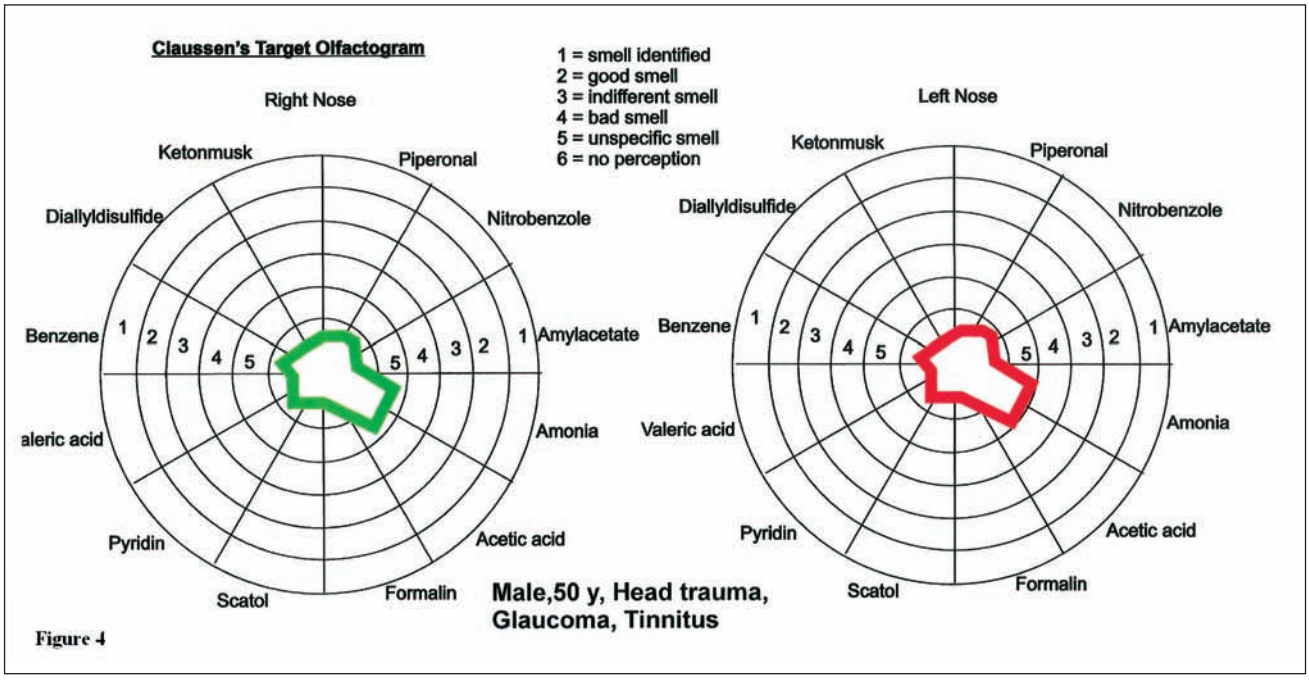

Figure 4

ing like a shooter's practice target. Each 90° quadrant contains the 3 main groups of odours and the class of trigeminal stimuli. Each substance is displayed over an angle of 30°.

The substances have been carefully selected in many scientific tests on samples of 150 test persons, each according to the question that they should be typical representatives of the test group (etheric, balsamic, aromatic etc.); moreover, the substances should be pure ones, which as long as they are visible in the test bottle, they should also be present in the gas above the crystals or the liquid. The substances should be as least toxic as possible. Furthermore, the typical fragrant or odour of the substance should be known to most of the test persons.

With these criteria in mind, we have selected the following substances being representative in our target olfactogram for the different basic odours:

1. Odores suavesolentes:

a. amyl acetate; b. nitrobenzene; c. piperonal

2. Odores medii:

a. ketone musk; b. diallyl sulfide; c. benzine

3. Foetores:

a. n-valeric acid; b. pyridine; c. scatole

4. Trigeminal stimuli:

a. formaldehyde; b. 3-M acetic acid; c. 25% ammonia solution.

For scoring the test results of the psychophysical test, Claussen has introduced, according to von Haller, a psychophysical scale of pleasant, indifferent and unpleasant. This scale is enlarged by identification of the substances on one hand and, on the other hand, unspecific sensation and no sensation. Thus, a 6-point scale has been established for the target olfactogram in order to characterize each partial test in the polar coordinate field. From the outer ring of the 6-point-target olfactogram towards the inner ring, the following findings are marked:

1. the test substance has been intellectually defined and correctly named by the test person;
2. pleasant smell without identification of the substance;
3. indifferent smell without identification of the substance;
4. unpleasant smell without identification of the substance;
5. unspecific sensation without any emotional or intellectual quality of the smell;
6. no sensation.

The test is performed using a sniffling method before and after decongestion of the nose. The test results are marked for the right and the left nostril point by point (Figures 1-6). The points are then connected similarly to the frequency results in an audiogram. The circular structure then gives a synoptic typical pattern for various diseases. Thus, the target olfactogram can be read in a single glance during the clinical presentation of the patient and associated with typical findings. The most frequent finding is a hyposmia or a partial anosmia. The complete anosmia exhibits the typical keyhole pattern. In allotriosmias of the unpleasant type of cacosmia or the pleasant type of heterosmia, the oval complex of the test result pattern is diagonally distorted from left down to right up or right up to left down.

Obstructive hyposmias or anosmias are easily detected, as the two curves of the smell test, before and

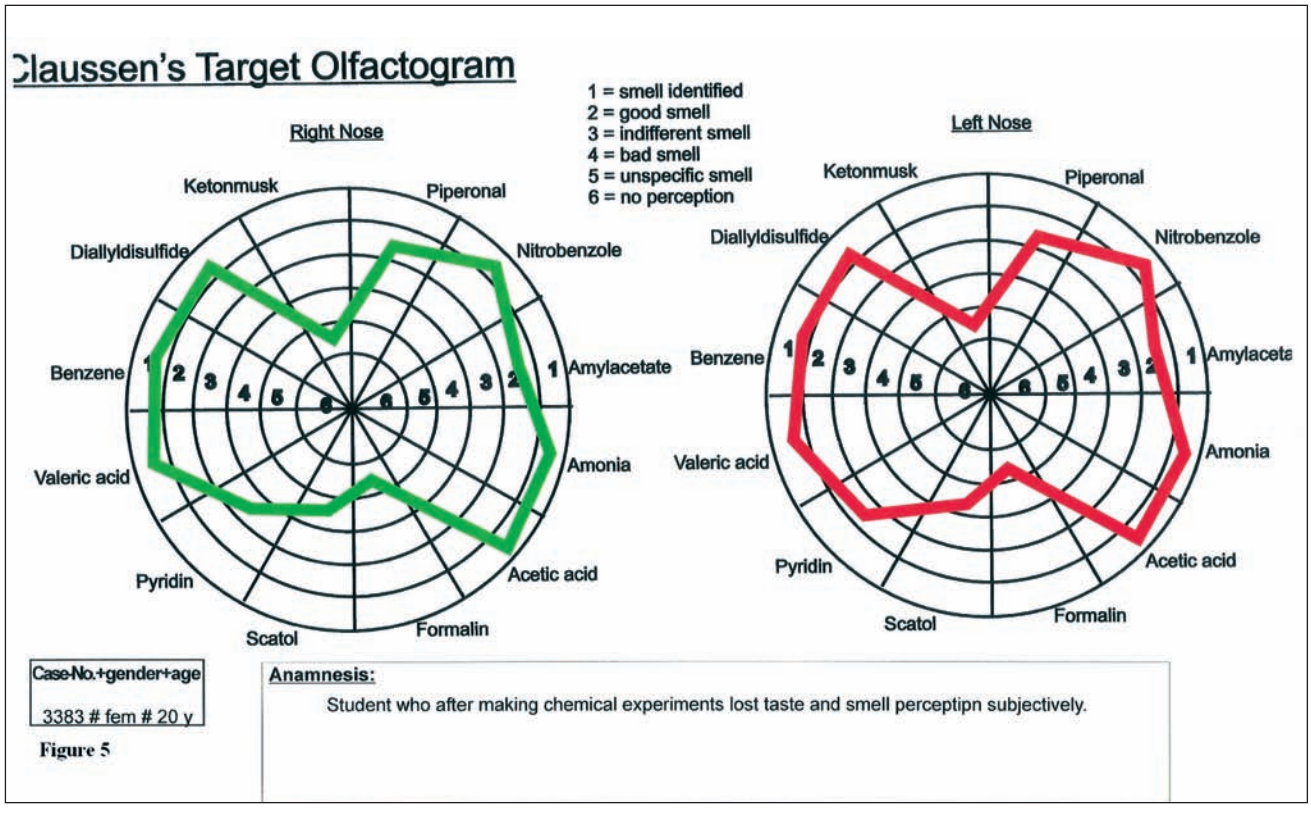

Figure 5

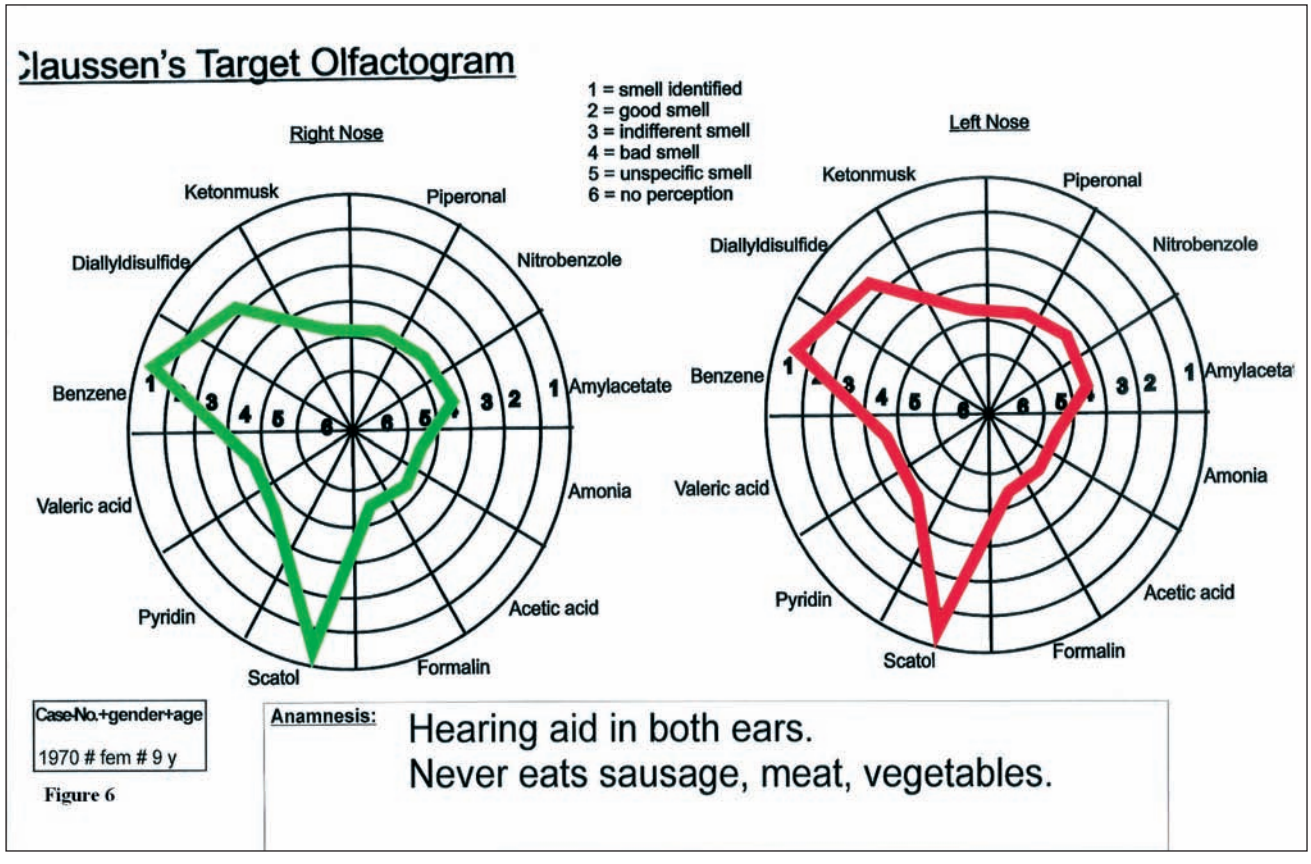

Figure 6

after decongestion, exhibit a broad gap between them.

Finally, complete nasal anesthesia can be differentiated from anosmias, as the latter exhibit a keyhole pattern, whereas the first only shows a center point.

CONCLUSIONS

The smell test according to the procedure of the target olfactogram is easily available in everyday clinical practice. The results can be quickly used in the files and clinical rounds. In posttraumatic smell disorders or other follow-ups, the development of the disease can be successfully monitored. The test chart allows differentiating between the various groups of the above mentioned smell deficiencies.

REFERENCES

1. Allis T.J., Leopold D.A. – Smell and taste disorders. Facial Plast Surg Clin North Am. Feb 2012; 20(1):93-111.
2. Joung Y.I., Yi H.J., Lee S.K., Im T.H., Cho S.H., Ko Y. – Posttraumatic anosmia and aguesia: incidence and recovery with relevance to the hemorrhage and fracture of the frontal base. J Korean Neurosurg Soc, 2007; 42:1-5.
3. Zwaardemaker H. – Classification des odeurs. In L'odorat, Paris: Doin, 1925;pp.178-224.
4. Wise P.M., Olsson M.J., Cain W.S. – Quantification of odor quality. Chem. Senses, 2000; 25:429-443.
5. von Haller A. – Liber XIV. Olfactus. Elementa physiologiae-Corporis umani. Tome 5. Lausanne: Grasset 1763; pp. 125-185.
6. Dubois D. – Categories as acts of meaning: the case of categories in olfaction and audition. Cognitive Science Quaterly, 2000;1:35-68.
7. Zwaardemaker H. - Die Physiologic des Geruchs. Leipzig, 1895; pp.324.