Patients and experiences from the first Danish flavour clinic

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ABSTRACT

INTRODUCTION: Chemosensory dysfunction is common. Although patients complain of taste loss, the most common cause of a diminished taste experience is olfactory dysfunction.

METHODS: Since January 2017, patients with complaints about smell and/or taste loss have been referred to the Flavour Clinic by ear, nose and throat (ENT) practitioners. Prior to referral, CT, endoscopy of the nasal cavity and allergy testing were required. Patients underwent full olfactory and gustatory testing, complete ENT and neurological examination and review of medicine and medical history. Patients also completed different questionnaires such as the Mini Mental Status Examination, the Sino-Nasal Outcome Test and the Major Depression Inventory.

RESULTS: Among 515 patients, 97% complained of olfactory loss and 82% complained of taste loss. While 89% had a measurable olfactory deficit, only 22% were found to have a gustatory deficit.

CONCLUSIONS: An accurate distinction between smell and taste requires application of validated chemosensory tests and specialised knowledge. As this is not readily available in all ENT clinics, sensory loss without a clear aetiology should be referred to a more specialised centre.

FUNDING: none.

TRIAL REGISTRATION: not relevant.

For most people, the sensory experience of eating and the ability to sense odours in our environment are an unsung part of daily routines. Fragments of attention are ignited when we are startled by encounters with certain odours, hedonic gastronomic experiences, or the lack of stimulation during a common cold. More than 70% of the sensory experience of food is estimated to derive from the olfactory stimulation of aromas, which reduces the overall tasting experience to a uniform flat experience following a loss of the olfactory sense. Smell is initially perceived through the nostrils (orthonasal smell); however, during food consumption, aromas from the food enter the nose through the pharynx (retronasal smell). The integrated perception of taste and retronasal stimuli in the conscious tasting experience explains why many patients with olfactory disorders initially complain of taste loss.

At least 1% of the population is estimated to have a complete loss of smell (anosmia) and 15% have a reduced sense of smell (hyposmia) [1, 2], making olfactory dysfunction a very common disorder. Apart from these quantitative olfactory disorders, olfactory disorders can have a qualitative nature where stimuli are distorted (parosmia) or emerge without apparent stimulation (phantosmia). Around 10% of patients with distorted flavour perception have an actual taste disorder, while only a few percent have isolated taste disorders. These include loss of taste (ageusia), reduced sense of taste (hypogeusia) or distorted sense of taste (parageusia).

In all cases, the sensory loss can cause a wide range of complications and consequences for patients. Patients often complain of a reduced quality of life due to limited enjoyment of food and exclusion from social interactions involving food and beverages. This may impair appetite and dietary composition. For olfactory disorders, social seclusion may occur due to fear of bodily malodours. Furthermore, olfactory cues of danger such as gas, smoke or spoiled foods can cause hazards. In sum, a sensory deficit can severely impair many aspects of life, and olfactory loss can substantially increase the risk of depression [3].

Compared with other senses, smell and taste disorders have been a reclusive matter, for patients and clinicians alike. However, this is changing as specialised taste and smell clinics have emerged across the US and Europe in conjunction with emerging anosmia patient groups and social media networks.

The majority of olfactory and gustatory disorders are peripheral or mucosal in aetiology [4], why examination, diagnostics and specialised clinics are generally established within the ear, nose and throat (ENT) speciality. In Denmark, the ENT specialist practitioners are included in the public free healthcare system and no referral is needed. Here, assessment of common causes of olfactory loss (e.g., chronic rhinosinusitis and allergy) is commonly diagnosed and treated in accordance with established guidelines. However, when the aetiology was not clear, no further steps of structured diagnostics were available until 2016.

Although many patients suffered from smell and taste loss, no specialised clinic or national guidelines existed. In 2016, the head of the ENT department, Region Hospital West Jutland, Denmark, decided to establish a clinical work-up for patients suffering from

ORIGINAL ARTICLE

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Dan Med J 2020;67(4):A09190495

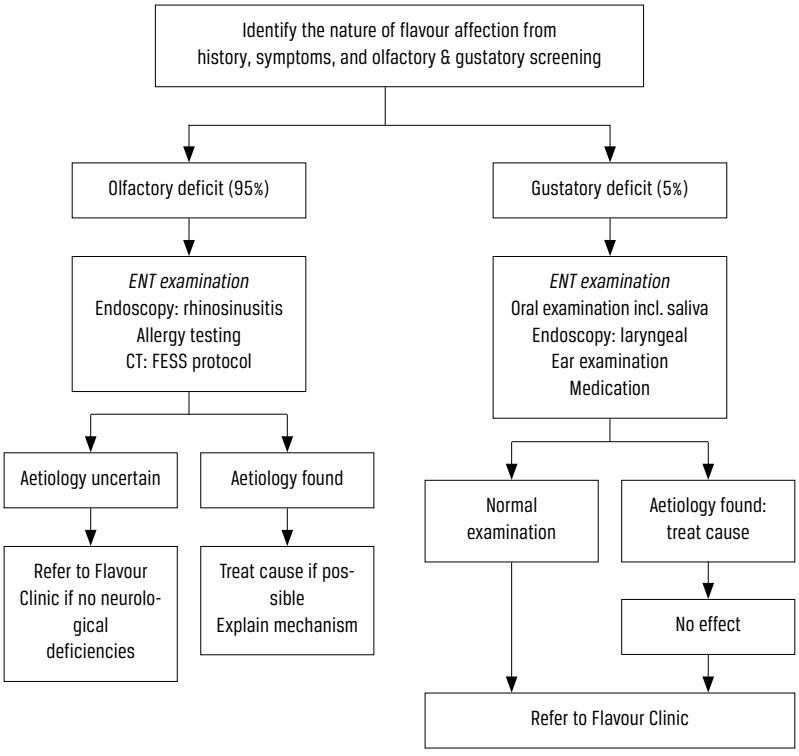
smell and taste disorders on request from the Flavour Institute. The aim of this manuscript is to describe the start-up of the first flavour clinic and to describe the demographics and sensory deficits of the initial ≥ 500 flavour patients in order to provide knowledge needed to create a data-driven national guideline for diagnosing of smell and taste loss.

METHODS

Setting up the flavour clinic

A prerequisite for accurate diagnostics of sensory disorders is validated taste and smell tests, and sufficient knowledge of cut-off values for diagnosing a sensory loss. Thus, normative data on the smell and taste function in the Danish population had previously been collected in studies conducted by the Flavour Institute [5-8]. Criteria for referral were based on advice from the leading German taste and smell clinic in Dresden and an assessment of our initial experiences with Danish flavour patients. These criteria were published on the Department's website: only ENT specialists could refer patients with subjective complaints about smell and/or taste dysfunction, and endoscopy of the nasal cavity was required prior to referral along with allergy testing and CT of the nose and sinuses (adults only) to identify treatable sino-nasal causes, see **Figure 1**.

FIGURE 1 / Diagnostic pipeline for patients with smell and taste disorders.



ENT = ear, nose & throat; FESS = functional endoscopic sinus surgery.

Initially, one examination room in the outpatient clinic was reserved per week for patients from all parts of Denmark. An ENT physician and a nurse trained in performing the various smell and taste tests were responsible for the work-up programme.

The official opening of the smell and taste clinic (the Flavour Clinic) was held in December 2016. The first patients were received in January and February 2017 – a pilot study period to obtain knowledge about the feasibility of the work-up programme and time consumption. The average time used per patient was two hours, and all patients were able to participate in all tests. As the Department had received no financial support from the Flavour Clinic, the Healthcare Classification System ("SKS") and the Diagnosis Related Groups (DRG) codes for the work-up programme were applied at the Danish Health Authority. Approval was achieved towards the end of 2017. In December 2018, the Central Denmark Region approved the ENT Department's financing of the clinic by DRG means. Up to this point, patients had been followed up by telephone calls only due to a lack of resources for a clinical visit. Furthermore, the number of referrals had stabilised at approximately 420 annual patients. Based on this information, the future dimensions of the Flavour Clinic were settled, and follow-up visits were included to document the effects of various treatment modalities.

Diagnostic workflow

The diagnostic workup in the Flavour Clinic consisted of the following: a questionnaire of taste and smell symptoms, the Sino-Nasal Outcome Test 22 (SNOT-22) questionnaire, the Major Depression Inventory (MDI) test, the Mini-Mental State Examination (MMSE), a complete list of medicine (current and prior), physical ENT examination including endoscopy with focus on the olfactory cleft and relevant (oto)neurological examination, Sniffin' Sticks olfactory threshold, discrimination and identification (TDI) test for olfaction and a taste strip test for gustation. Subsequently, the taste strip test was replaced by a taste spray screening and the taste drop test, as a comparative study had demonstrated superior validity of the taste drop test [8]. Olfactometry and electro-gustometry were reserved for medico-legal cases. For any MDI score of ≥ 26, referral for assessment of depression was discussed – and referral was recommended for a score of ≥ 31 [9]. For a MMSE score of ≤ 24, further cognitive assessment was generally recommended [10].

On suspicion of underlying central pathology, 1.5-T MRI was recommended as well as referral to a relevant speciality for further evaluation and treatment. A 3-T MRI was conducted in patients with unclear aetiology, idiopathic or suspected congenital smell loss. As the 3-T MRI protocol demands special sequences for visual-

isation of the olfactory bulb and olfactory sulcus, the 3-T MRs were assessed by a neuroradiologist trained in olfactory structures.

Furthermore, a REDCap database was created for demographics, examination results, diagnoses and treatment modalities where all data from consenting patients are registered [11].

Olfactory testing

Depending on the purpose, different olfactory tests are available. For a brief screening of olfactory function, the Sniffin' Sticks 12-item identification test is recommended [7]. This – or a similar validated screening test – is recommended for ENT practitioners. For more specialised testing, the Flavour Clinic uses the Extended Sniffin Sticks test for all patients, where TDI abilities are assessed [6]. In cases with discrepancies between subjective aroma perception and the orthonasal function (incl. TDI score), retronasal olfactory testing is applied, testing the aroma identification abilities after application of powders in the patient's mouth [12].

The use of a validated identification test is mandatory. A direct translation from other languages and/or cultures leads to inclusion of unfamiliar descriptors and, hence, uncertainty in the differentiation between normosmia, hyposmia and anosmia [13].

Gustatory testing

The first 138 consecutive patients in the Flavour Clinic were tested with taste strips. The Taste Strip Test was subsequently replaced by the Taste Drop Test, as this had a higher re-test reliability (see [8] for detailed description of the test). After this substitution, all patients were screened using taste sprays [14] that contain a concentration of each tastant equivalent to the lowest normal score in the Taste Drop Test. If all tastants were not recognised during the taste spray screening, patients were subsequently tested using the Taste Drop Test.

Trial registration: not relevant.

RESULTS

More than a thousand patients have undergone testing and diagnostic workup in the clinic from its opening in January 2017 to August 2019. Patients were referred by ENT practitioners from all five Danish regions (see demographics in **Table 1**). Here, we present data from the first 515 consecutive patients who were diagnosed and entered into the REDCap database. All patients were included in this study based on their first outpatient visit to the Flavour Clinic. The most common diagnoses for referral were anosmia (50%), hyposmia (29.4%), parosmia (17%) and affected gustatory function (30.4%). Previous screening of the olfactory and/or gustatory function was mentioned in 16% and 4% of referrals, respectively.

TABLE 1 / Demographics. Information available at referral.

Patients, n	515
Gender, male, n (%)	212 (41)
Age, median (range), yrs	57 (7-91)
Smoking status, n (%)	
Current smokers	43 (9)
Previous smokers	149 (29)
Non-smokers	314 (62)
Allergies, n (%)	
Allergy	136 (27)
No allergies	327 (65)
Unknown	41 (8)
CT, n (%) (N = 472[a])	
Sino-nasal abnormalities	206 (40)
Subjective sense of smell, n (%)	
Normal	15 (3)
Reduced	190 (38)
Absent	297 (59)
Subjective sense of taste, n (%)	
Normal	93 (18)
Reduced	293 (58)
Absent	122 (24)

IQR = interquartile range.
a) A few patients did not receive a CT prior to their referral, i.e. children with suspected congenital anosmia and no objective or subjective signs of sino-nasal disease.

After filling in a questionnaire on taste and smell symptoms, patients underwent olfactory and gustatory testing and completed further questionnaires assisted by a trained nurse (**Table 2**). Among patients tested with taste strips (n = 138), 28% had hypogeusia and 8% had ageusia. Of the 262 patients who had undergone gustatory screening with taste spray, failure to identify all four basic tastants occurred in 26 (10%) patients, who required further gustatory testing with the Taste Drop Test. Among patients tested with Taste Drop Test either after gustatory screening or due to their referral diagnosis (n = 82), 26% had hypogeusia and 24% had ageusia. Furthermore, patients with isolated ageusia were tested for oral candidiasis (oral swab) and various deficiencies (blood sample).

Of the 515 first patients referred to the Flavour Clinic, 46% had anosmia, 43% had hyposmia and 11% had a normal sense of smell. Taste function was not as severely affected as 7% had ageusia, 15% had hypogeusia and 78% had a normal sense of taste. Only 16 patients had an isolated taste loss (see aetiologies in **Table 3** and treatment/referrals in **Table 4**).

DISCUSSION

The Flavour Clinic is the first specialised clinic in Denmark for smell and taste disorders. The need for improved focus, diagnostics and treatment for this patient

TABLE 2 / Test scores in the Flavour Clinic.

	Median (range)
SNOT-22	19 (0-70)
MMSE	29 (23-30)
MDI	5 (0-55)
Olfactory scores	
Threshold	1 (1-12)
Discrimination	7 (0-16)
Identification	7 (0-16)
Total TDI-score	16 (1-41.75)
Gustatory scores	
Taste spray (n = 263)	4 (1-4)
Taste strips (n = 138)	13 (2-18)
Taste drop test (n = 82)	25 (12-35)

MDI = Major Depression Inventory; MMSE = Mini Mental State Examination; SNOT-22 = Sino-Nasal Outcome Test-22; TDI = Sniffin' Sticks Threshold, Discrimination and Identification test.

TABLE 3 / Chemosensory loss aetiologies in Flavour Clinic patients (N = 515). The values are %.

Olfactory loss (n = 457)	
Postinfectious	31
Sino-nasal incl. CRS and allergy	26
Idiopathic	24
Posttraumatic	10
Congenital	3
Iatrogenic	3
Medicine/toxic	2
Other[a]	1
Gustatory loss (n = 99)	
Infection	27
Idiopathic	23
Iatrogenic	5
Medicine	5
Other, e.g. deficiencies[b], stroke, trauma	40

CRS = chronic rhinosinusitis.
a) Stroke, tumour, systemic disease.
b) Vitamins, iron/anaemia, zinc.

TABLE 4 / Most frequent interventions and referrals after initial diagnostics of taste/smell loss in the Flavour Clinic. The values are %.

Treatment	
Olfactory training	66.8
Nasal saline irrigation	53.0
Nasal steroid drops	48.7
Further examination/diagnostics	
Neurologic evaluation, e.g. neurologic deficits, signs of dementia or Parkinson's disease	3.5
Surgical evaluation, e.g. polyps, nasal septum, conchae	1.0
Endocrinological evaluation, e.g. suspicion of Kallmann syndrome	1.0
Psychiatric evaluation, e.g. psychosis, severe depression	0.4

group is underlined by the number of patients and the continuous referral of approximately 400 annual patients.

Even though many patients are aware of an olfactory component to their sensory loss, 83% complain of a taste disturbance at the time of referral. Previous olfactory and/or gustatory screening was mentioned in 16% and 4% of referrals, respectively. This shows that routine chemosensory screening is often not conducted [15]. As the prognosis for regaining function – and effects of e.g., olfactory training – is notably better in hyposmia than in anosmia [16, 17], this lack of testing reduces diagnostic accuracy; and as a consequence, quality of care declines. Furthermore, for the 23% of patients with an idiopathic smell loss, the need for additional neuroimaging and follow-up to identify potential central causes of olfactory deficits should be appraised continuously.

After thorough assessment of their disorder, including olfactory and gustatory testing, patients can be informed of the exact nature of their sensory loss (olfaction or/and gustatory). This information includes aetiology, prognosis, need for further examination or referrals and possibilities for treatment or rehabilitation through training (see references for more details on aetiologies [18, 19] and current treatment options [20]). Furthermore, the clinic focuses on advising patients on safety and coping measures, e.g., food labelling, fire/gas alarms and gastronomic means of sensory compensation. An intensive online olfactory training programme has been initiated on a trial basis. For patients with idiopathic smell loss, an additional weekly day in the outpatient clinic was scheduled for follow-up examinations.

As such, the Flavour Clinic was established to ensure that patients receive an accurate diagnosis, improve awareness on chemosensory disturbances and to aid ENT practitioners in achieving the diagnostic guidelines and tools needed to assess flavour patients, as well as providing an option for referral for patients with competing aetiologies.

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ACCEPTED: 5 February 2020
CONFLICTS OF INTEREST: none. Disclosure forms provided by the authors are available with the full text of this article at Ugeskriftet.dk/dmj
ACKNOWLEDGMENTS: *Andreas Steenholt Niklassen*, ENT Department, Holstebro, for examination and diagnosing of some of the patients in the Flavour Clinic; *Thomas Hummel*, Department of Otorhinolaryngology, University of Dresden Medical School, Germany, for assistance with setting up the clinical diagnostic pipeline in the Flavour Clinic.

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