Smell and taste dysfunction following minor stroke: A case report

By Theresa L. Green, Lisa D. McGregor and Kathryn M. King

Abstract
Smell (olfactory) and taste (gustatory) are key senses in the regulation of nourishment and individual safety. Olfactory and gustatory dysfunctions have been infrequently reported together in patients following stroke (Landis et al., 2006; Leopold et al., 2006). This case report details two patients who experienced smell and taste dysfunction following minor stroke events. Symptoms reported included hyposmia (diminished sense of smell) and anosmia (complete loss of smell), and dysgeusia (distorted taste). Patients’ sense of smell and taste were assessed in an ambulatory care stroke prevention clinic eight months following their strokes. Patient A presented with minor stroke due to a lesion in the anterior circulation, patient B with a lesion in the posterior circulation. Both patients reported intense olfactory and gustatory dysfunction immediately following their strokes. Examination revealed a general inability to detect subtle odours and the ability to identify only ‘sweet’ tastes for both patients. In addition, both patients reported heavily salting or sweetening their food to mask the distorted and unpleasant taste, which also impacted comorbid conditions such as hypertension and diabetes. Patients and their spouses reported a decrease in their appreciation of family-related activities due to the patients’ olfactory and gustatory dysfunction. Patients reported weight loss, lack of energy and strength, likely due to poor nutrition. Olfactory and gustatory dysfunctions are potentially deleterious outcomes following minor stroke and should be assessed by healthcare professionals prior to patient discharge. Assistance may be required to promote the health and well-being of patients and their carers if smell and taste are impacted by the stroke event.

Introduction
Smell (olfactory) and taste (gustatory) are key senses in the regulation of nourishment and safety. For example, they alert humans to dangers such as spoiled food, fire, and smoke inhalation (Hummel, & Welge-Luessen, 2006; Cereda, Ghika, Maeder, & Bogousslavsky, 2002). Furthermore, smell and taste are interdependent; patients may have difficulty distinguishing between the two, often confusing the concepts of smell and taste (Mann, 2002; Bromley, 2000). Though olfactory dysfunction is relatively common in the general population, disorders of smell, as well as taste have been infrequently reported. Is there an incidence to quantify in patients following stroke (Landis, Leuchter, San Millan, Lacroix, & Landis, 2006; Leopold, Holbrook, Noell, & Mabry, 2006)?

These disorders may be a symptom of underlying disease and can have a significant impact on quality of life. The most common causes of smell disturbances include nasal and sinus disease, upper respiratory infection, medications, smoking, head trauma or other neurological conditions including parkinsonism, Alzheimer disease, Huntington chorea, or multiple sclerosis, endocrine disorders including diabetes mellitus, hypothyroidism, and hypogonadism, depression, and aging, in which loss of olfactory sensitivity occurs (Mann, 2002; Bromley, 2000). Clinical manifestations of smell disorders include hyposmia (diminished sense of smell); dysosmia (distorted smell identification) either parosmia (abberent odour perception), phantosmia (without an odour stimulus), or agnosia (with an odour stimulus but unable to classify); and anosmia (total loss of smell) (Mann, 2002).

Altération des sens de l’odorat et du goût à la suite d’un AVC : une histoire de cas

Sommaire
Les sens de l’odorat et du goût jouent un rôle très important au niveau de la nutrition et de la sécurité des individus. La combinaison des troubles du sens de l’odorat et du goût à la suite d’un accident vasculaire cérébral (AVC) est rarement mentionnée dans la littérature. (Landis et al, 2006; Leopold et al. 2006). Cette étude de cas raconte l’histoire de deux patients ayant subi une altération des sens l’odorat et du goût à la suite d’un AVC. Les symptômes suivants sont apparus: l’hypo-osmie (diminution de l’odorat), l’anosmie (perte du sens de l’odorat) et la perte du sens du goût. Les sens de l’odorat et du goût furent évalués chez les patients ayant souffert d’un AVC dans une clinique de prévention des AVC, huit mois après l’AVC. Le patient A s’est présenté avec unincident mineur localisé dans la circulation cérébrale antérieure, le patient B avait une lésion dans la circulation postérieure. Des troubles graves du sens de l’odorat et du goût se sont manifestés chez les deux patients immédiatement après l’AVC. L’examen des deux patients a révélé une déficience à reconnaître les odeurs subtiles ainsi qu’un sens du goût se limitant à discerner les aliments sucrés. De plus, les deux patients ont avoué saler et sucrer généreusement leur nourriture pour en masquer le mauvais goût désagréable. Les patients et leur conjoint ont mentionné qu’ils sont devenus désintéressés aux activités familiales à la suite de la perte des sens de l’odorat et du goût. Ils ont remarqué une perte de poids, d’énergie et de force physique du à la malnutrition. Les conditions de co-morbidité tels que l’hypertension et le diabète, furent perturbées par l’apport excessif de sel et de sucre ajoutés aux aliments. La perte des sens de l’odorat et du goût, due ‘a un accident vasculaire cérébral, est potentiellement très dommageable. Elle devrait être évaluée par les professionnels de la santé avant le départ du patient. Un plan d’action au niveau personnel et professionnel, s’adressant à la promotion de la santé et du bien-être des patients ayant subi une perte ou une diminution des sens de l’odorat et du goût à la suite d’un accident vasculaire cérébral, pourrait s’avérer nécessaire.
Taste disorders can result from aging, inflammation of the mouth, infection, gastric reflux, head trauma, smoking, medications used to treat such conditions as depression (e.g., tricyclic antidepressants), epilepsy (e.g., carbamazepine or phenytoin sodium), Parkinson disease (e.g., levodopa), migraine (e.g., tritriptans), and hypertension (e.g., captoril), or systemic conditions such as diabetes, pernicious anemia, or Crohn’s disease (Heckmann, Heckmann, Lang, & Hummel, 2003; Mann, 2002). Types of taste dysfunction include hypergeusia (diminished taste), dysgeusia (distorted taste), aligeusia (altered taste, usually pleasant), phantogeusia (persistent abnormal taste in the absence of a stimulus), and ageusia (no taste). Hypergeusia, dysgeusia, and phantogeusia are the most commonly reported types of taste disorders (Heckmann et al., 2003).

The purpose of this case report is to describe the smell and taste dysfunction in two patients following minor cerebrovascular stroke. One patient (A) presented with hyposmia (diminished sense of smell), the other (B) a transient anosmia (complete loss of smell) and both patients reported dysgeusia (distorted taste) subsequent to minor stroke. Testing of both patients’ olfactory and gustatory senses was performed by a stroke neurologist blinded to the patients’ medical history. While standardized smell and taste dysfunction kits are available, they are not routinely used by clinicians at our site. Thus, to test the sense of smell, patients were asked to inhale the scent of common pungent spices (cloves, cinnamon, coffee, vanilla, and lemon), through one nostril while the other nostril was plugged. The patients were then asked to identify the scent. The taste test assessed four taste qualities, sweet, sour, salty, and bitter, using sugar, lemon, salt, and black coffee (Leopold et al., 2006; Heckmann et al., 2003). A liquid concentration of each flavour was applied to the right and left side of the anterior third of the tongue, using a cotton swab. After each application and with their tongue still extended, patients were asked to identify the taste from a list of the four descriptors.

Case report A

In January 2006, while eating dinner, a 63-year-old man experienced sudden onset of left arm heaviness and weakness with left facial droop. On admission to the tertiary care stroke unit, the initial neurological exam revealed left arm weakness with a pronator drift, intact sensory function, and VII cranial nerve facial weakness. Based on neurological examination, he was assessed as having a National Institutes of Health Stroke Scale (NIHSS) score of 2. Admission blood pressure was 160/85 mmHg and the patient had a regular apical heart rate of 70 BPM. The diagnostic workup included CT, MRI, magnetic resonance angiography (MRA) and transthoracic echocardiogram/transesophageal echocardiogram (TTE/TEE). A diagnosis of acute right corona radiate lacunar ischemic stroke was made. CT findings included old bilateral lacunar strokes. The MRI revealed a right corona radiate lacune with right suprachoroidal ICA stenosis (Figure 1). CTA revealed a tight right ICA. Doppler ultrasound revealed stenosis of the right ICA of 50% to 69%. Finally, TEE revealed mild LV dysfunction. The patient underwent a right carotid endarterectomy five days following initial admission and was discharged from hospital the following day. Medications upon discharge included Hydrochlorothiazide 12.5 mg daily, Atorvastatin 40 mg daily, ASA 81 mg daily, Folinopidine 10 mg daily, Glyburide 2.5 mg daily, and Metformin 500 mg daily. Comorbid conditions included hypertension, dyslipidemia, and diabetes and a remote history of smoking (quit > 20 years ago). He also had a history of cardiac disease and had undergone coronary artery bypass graft surgery six months previously.

Immediately after the stroke, this patient noticed a general reduced sense of smell with the smell of meat particularly described as unpleasant with a slightly “rotten” odour. Over the first three months post-discharge, his sense of smell remained diminished. He described one potential benefit, however, in that he could no longer detect the smell of cigarette smoke. He complained food eaten while in-hospital tasted unpleasant and post-discharge described the taste of most food as either unpleasant, bitter, or as having no taste. While he was able to identify a food item as tasting “sweet” he was unable to name the actual flavour (e.g., chocolate). During this period, he reported a weight loss of two kilograms.

A smell and taste test conducted eight months post-stroke revealed the patient was able to faintly appreciate the smell of cloves, but was unable to detect cinnamon or coffee. He was also able to faintly identify a sweet taste, but had no appreciation of sour, salty, or bitter tastes. There was no difference detected between sides of the tongue in discriminating between tastes. At this time, his weight loss was more significant. The patient reported losing 4 kg and had to “make” himself eat as some foods, specifically meats, triggered an extreme revulsion reaction (retching). He noted that his loss of appetite and lack of energy resulted in fatigue, which impacted the ability to work, and a general inability to enjoy family-related activities.

This patient described a similar experience with loss of smell and taste following a cerebral concussion received many years (> 20 years) prior to his stroke, with these senses returning to normal approximately one year later.

Case report B

This 61-year-old man experienced a minor stroke in February 2006. He awoke at 0500 hours with loss of coordination on the right side and blurring of vision in both eyes, but did not describe...
any limb weakness, sensory loss, or speech disturbances. A headache with severe nausea began at 1000 hours that morning. On admission to the tertiary care stroke unit, his neurological exam revealed normal motor strength bilaterally, right dysmetria, and intact cranial nerve testing. His sensory exam revealed decreased pinprick to the right face and oculomotor examination revealed right superior quadrantanopia, tortional nystagmus in all directions, and bidirectional horizontal nystagmus. Admission vital signs were normal, with a BP of 134/84 mmHg and a pulse of 80/minute. He was assessed as having an NIHSS score of 2. Diagnostic workup included CT, MRI, MRA, TTE/TEE and modified barium swallow. An acute right superior cerebellar infarct was revealed on CT and MRI imaging. His MRI scan also revealed a small acute right posteriolateral medulla lacunar infarct (Figure 2). TTE showed a mild to moderate impairment of left ventricular systolic function secondary to an inferior and posterolateral wall motion abnormality and mild to moderate pulmonary hypertension. A barium swallow exam revealed incomplete inversion of the epiglottis with pooling within the valleculae and piriform sinuses. Co-morbid conditions and risk factors included hypertension, dyslipidemia, and current smoking. He also had a history of ischemic heart disease. There was no history of depression noted. Discharge medications included hydrochlorothiazide 12.5 mg daily and atenolol 5 mg daily.

Interestingly, this patient reported the sudden onset of smell and taste dysfunction approximately one month prior to his current stroke event although the symptoms were subtle. At that time, his family physician prescribed a course of antibiotics for a suspected sinus infection. However, this did not eliminate the smell and taste symptoms. A subsequent visit to an otolaryngologist did not reveal any anatomical abnormalities. However, following his admission for the current stroke event, a review of CT and MRI imaging revealed a subacute left-sided lentiform stroke.

Following his current stroke, the patient reported his olfactory and gustatory sensory disturbance became intense and “food smelled and tasted like vomit.” Over the subsequent eight months, the impaired sense of smell and taste resulted in weight loss (reported to be approximately 9 kg overall, 5-6 kg over the first three months post-stroke), fatigue and lack of energy due to loss of appetite and poor nutrition, and a decrease in quality of life due to loss of interest in food. During the first three months post-stroke when these dysfunctions were most severe, the patient could tolerate only very sweet candies, such as chocolate. The smell and taste of breads, pasta, coffee and meat made him ill. At six months post-stroke, he noted a change in his ability to taste. He could now detect food items that were heavily sweet or sour. He described heavily salting his food in order to mask the actual taste, and reported hot foods had little or no taste, but were tolerated better than cold food items, which remained unpleasant.

At eight months post-stroke, a test of olfactory function revealed a general inability to detect subtle odours. However, stronger odours such as coffee, cloves, and lemon could be detected with the left nostril. The patient reported these smells to be “bad”. Taste testing revealed a generally “unpleasant” rating with sweetness faintly detected on the left side of the tongue. Bitter, sour, and salty items could not be detected on either side of the tongue. This patient reported occasional difficulties with swallowing, most notable when tired or eating late in the evening.

**Discussion**

In both cases, patients reported intense olfactory and gustatory dysfunction immediately following their minor strokes. Anatomically, one patient presented with minor stroke due to a lesion in the anterior cerebral circulation; the other with a lesion in the posterior circulation. Functional MRI has been used to show the cortical areas associated with the processing of gustatory stimuli are found in areas of the brain perfused by the anterior or the posterior circulatory systems, including the insula, the parietal and frontal opercula, and the orbitofrontal cortex (Heckmann et al., 2003; Cereda et al., 2002). Kobayakawa et al. (2005), through the use of magnetoencephalography, identified the transition area between the posterior insula and parietal operculum as the primary gustatory area in humans. In addition, strokes occurring in the pons can result in altered taste sensation. MR imaging for patient A in this review revealed chronic small vessel disease on the left side of the pons; patient B experienced a medullary lacunar infarction.

The natural aging process may have been a factor in diminished smell and taste experienced in both these patients. A natural reduction in smell and taste senses has been reported in patients over 60 years of age (Boyce & Shone, 2006; Landis et al., 2006). However, neither patient noted any general diminishing of these senses over time prior to their stroke. Both patients were also hypertensive, treated with hydrochlorothiazide. Antihypertensive medications, particularly ACE inhibitors, but also hydrochlorothiazide have been associated with loss of smell and taste (Bromley, 2000). Nonetheless, this medication was utilized over an extended period prior to the stroke event (> 5 years), with neither patient reporting changes to smell or taste. As well, patient A was diabetic; a condition associated in the general population with diminished sense of taste (Mann, 2002; Bromley, 2000). Still, this patient had been diabetic for many years, without noting deterioration in his sense of taste. Similarly, patient B, with phantosmia and dysgeusia, identified that throughout his 20+ year history of smoking, these extreme smell and taste aversions were not present.

![Image](image-url)
Heckman et al. (2003) noted that patients do not often report problems with taste, particularly if other stroke symptoms are present. Thus, assessment of olfactory and gustatory function tends to be an overlooked entity in the plan of care during the acute stage of illness. This is especially problematic for patients with minor stroke, as hospital stay is typically very short, often only three to four days. The impact of this disorder may, therefore, not be seen until later in the recovery process, as with the second patient.

The duration of olfactory and gustatory dysfunction post-stroke is variable, although symptoms seem to spontaneously abate or resolve over time (Landis et al., 2006; Deems, Yen, Kreshak, & Doty, 1996). However, the techniques employed by the patients described here to counter the taste dysfunction included such things as heavily salting food items or consuming very sweet foods. Given their comorbid conditions, which included hypertension, hypercholesterolemia, and diabetes, these tactics could contribute to difficulty in maintaining adequate control of these conditions.

Conclusions

While the senses of smell and taste are not considered crucial to life, impairment can affect everyday enjoyment of food and may contribute to anxiety, depression, anorexia, nutritional deficiencies, and subsequent deterioration in quality of life (Hummel & Welge-Luessen, 2006; Leopold et al., 2006). In both case reports, the patients and their wives reported being profoundly impacted by the patients’ distorted sense of taste. Life quality was affected in that the patients experienced difficulty attending to work-related tasks due to lack of energy and strength. Wives bore the burden of finding nutritional food that could be tolerated and, as a couple, social outings were limited. It is important to note this was not a mere inconvenience for the patient and his wife, but a significant factor in the recovery trajectory.

Patients with minor stroke are often discharged very quickly from acute care following their stroke event and, given the emphasis on other physical sequelae of stroke, disturbances of smell and taste may not be identified by patients. Nurses may also be challenged to a) identify all pertinent post-stroke issues, and b) deliver optimal patient education. Nurse-patient interactions at this time often focus on education related to post-stroke functional/physical needs and recovery, medication and follow-up appointments. Less emphasis is given to other elements of post-stroke recovery, including issues that may impact life quality such as diminished smell and taste. This is an important consideration, as measures taken to enhance the palatability of food may be detrimental to overall health and well-being, such as heavily salting food or reliance on excessive sweetening.

It is also important to consider the needs of the primary carer in the home, as the responsibility for meal preparation and social interactions often is their responsibility. It may be worthwhile, therefore, for clinicians to add a simple question about smell-taste-related problems to the pre-discharge education component of patient care. A question such as, “Do you have difficulty recognizing food or beverages as sweet, sour, salty, or bitter?” may lead to identification of problems with these senses and, by extension, to assistance and support with management.

About the authors

Theresa L. Green, RN, PhD, Faculty of Nursing, University of Calgary, Calgary, AB. She is a post-doctoral fellow in the Department of Clinical Neurosciences.

Correspondence regarding this article should be addressed to Dr. Theresa L. Green, Calgary Stroke Program, Department of Clinical Neurosciences, University of Calgary, Foothills Hospital, Rm C1101A, 1403 29th Street NW, Calgary, AB T2N 2T9. E-mail: greentl@ucalgary.ca

Lisa D. McGregor, RN, MSc, Research Assistant, Faculty of Nursing, University of Calgary, AB.

Kathryn M. King, RN, PhD, Professor, Faculty of Nursing, University of Calgary, AB.

Acknowledgements and funding

Dr. Green is funded by the Heart and Stroke Foundation of Canada, the Canadian Stroke Network, Canadian Institutes for Health Research and the Alberta Heritage Foundation for Medical Research. Dr. King is a Population Health Investigator funded by the Alberta Heritage Foundation for Medical Research.

References


