Review Article

Anosmia-What we know about anosmia and what we don't know about it

Abstract

Anosmia, or the inability to detect scents, can have serious psychological consequences, including feelings of physical and social vulnerability and victimization. Anosmia can occur because of nasal obstruction caused by nasal polypi, enlarged turbinates, or oedema of mucous membrane as observed in common cold, allergic rhinitis and also in vasomotor rhinitis. Anosmia is also seen in atrophic rhinitis which is a degenerative disorder of nasal mucosa, peripheral neuritis, injury to olfactory nerves or olfactory bulb which can happen due to fractures of anterior cranial fossa and intracranial lesions like abscess, tumour or meningitis which results in pressure on olfactory tracts. These intense effects result from a state, people with normal olfactory abilities treat it with a lack of sympathy and apathy since it has a quick start and a poor outlook for recovery. Evidence-based treatments for anosmia are limited so there is a need to disseminate information about the health risks associated with anosmia, which could include screening procedures for olfactory abnormalities that are practicable and useful, adequate clinical assessment, and advice to patients to prevent harm and control health and quality of life with anosmia. The National Institute on Deafness and Other Communication Disorders estimates that approximately 1.4% of the population of the United States have chronic olfactory disorders and odor loss. The goal of this post was to go through the numerous types of anosmia and olfactory diseases, as well as their differential diagnoses, assessments, and current treatment options.

Keywords: Genetics, Olfactory Dysfunction, Neural Reorganization.

Introduction:

Anosmia is the partial or entire lack of the sense of smell. This loss can be transient or everlasting. Common situations that worsen the nose's lining, inclusive of hypersensitive reactions or a cold, can result intransient anosmia. More critical situations that have an effect on the mind or nerves, inclusive of mind tumors or head trauma, can motive everlasting lack of smell. Old age on occasion reasons anosmia.(1)There are numerous explanations for this. Smell perception loss can be caused by any mechanical constraint that inhibits odors from reaching the olfactory nerves, for example. This obstruction could be caused by inflammatory procedures such as simple infections that result in formation of polyps in the nose or mucus plugs. Factors related to the brain include disruption in the sensory nerves that form olfactory bulb, or wherever along the scent signal's path to the brain.(2)Anosmia may be a risky condition, as odor is used regularly while detecting dangerous situations. For example, people tormented by anosmia can be not able to locate the scent of smoke or risky gases, which might commonly alert them to a risky scene. This explains why a few aged humans salt their meals extra than more youthful humans do. However, this elevated sodium consumption can boom blood extent and blood pressure, growing the chance of cardiovascular illnesses in the aged.(3)

Causes of Anosmia

1. Genetic

Congenital anosmia can also additionally arise as an remoted abnormality or be related to precise genetic disorders (inclusive of Kallmann syndrome and congenital insensitivity to pain). Most instances of remoted congenital anosmia (now no longer related to extra symptoms) arise sporadically in human beings without a own circle of relatives records of the circumstance. In those human beings, the precise underlying motive of the circumstance is unknown. Scientists suspect that the circumstance is because of odd improvement of the olfactory device (the sensory device used for feel of smell) previous to birth. This can also additionally consist of abnormalities of the nasal cavity; disruptions withinside the pathway that contains facts from the nostril to the mind; or malformations of the part of the mind that approaches feel of smell. When isolated congenital anosmia impacts multiple own circle of relatives member, it can have a genetic component. One study observed that a few humans tormented by remoted congenital anosmia have changes (mutations) withinside the PROKR2 gene or PROK2 gene. These genes have formerly been said in humans with Kallmann syndrome (an inherited situation related to congenital anosmia and different symptoms).Another look at observed that brothers with anosmia had a mutation withinside the CNGA2 gene. However, in maximum familial instances of remoted congenital anosmia, the purpose stays unknown.(4)

2. The olfactory tract is underdeveloped (physiology).

It has also been suggested that the development of olfactory capabilities could be the cause. The absence or underdevelopment of the OB and olfactory tract is a common symptom in congenitally anosmia patients, thirteen. Because the glomeruli map is stored in the OB, shrinking the bulb results in a less precise or decreased scent identification judgement, and a lack of it

would mean no odor perception. For congenital anosmia, the intensity of the olfactory sulcus within the frontal brain is also reduced. An intensity of less than or equal to 8 mm indicates remoted anosmia, although a deeper intensity no longer invariably indicates anosmia. The extent and thickness of the appropriate frontal cortex, where the olfactory sulcus is located, are associated to olfactory characteristic in healthy people. In congenital anosmia, a thicker piriform cortex (and every other structure involved in olfaction) becomes evident, and olfactory features are linked to the left-facet cortex. All of these mental processes are controlled by the complex olfactory system. If they go below a certain threshold, it could indicate a loss of smelling ability. Anosmia can also be caused by the number of neurons present. Our bodies and synapses make up the grey count, while the axons make up the white count. The white count is substantially less dense than the grey count, with fewer functionally large systems, such as mobile bodies and synapses. Larger grey count was shown to be associated with greater olfactory feature in MRI imaging of healthy patients. People who were born with anosmia had a higher white count, while those who developed olfactory dysfunctions had a lower grey count. Anosmia may also be caused by body form, as there appears to be a lower number of neural grey cells in anosmia cases.(4)

3. Injury

Head Injury

Another common cause of anosmia is head injury, which can cause injury to the sinuses and also to the nose, resulting in obstruction along with mechanical blockage. Anosmia can be caused by damage or demolition at the cribriform plate of the olfactory axons, injury to the olfactory bulb, or direct damage to the cerebral cortex's olfactory regions. Depending on the place and intensity of the injury, the central nervous system injury that causes anosmia can be transitory or permanent. The ability of olfactory neurons to regenerate in a way that other central nervous system nerves in the body do not. Much contemporary stem cell research revolves around this one-of-a-kind ability.

There may also be other stressful or obstructive disorders. Some other causes of anosmia are :Olfactory dysfunction produced by hazardous chemicals such as nicotine, medicines, and vapors, as well as olfactory dysfunction after post-viral infection, Sinus/Nasal deformities, tumors of brain or nasal cavity that impede the pathway of olfactory signal and hemorrhages of subarachnoid region are all examples of facial trauma. Meningioma of the olfactory groove can cause progressively deteriorating olfactory impairment. Diabetes mellitus and hypothyroidism are two frequent illnesses that can result in a loss of smell or anosmia. As an unintended side effect of some medications, olfactory abnormalities might occur. These treatments include beta-antagonists, anti-thyroid medications, calcium channel blocker like dihydropyridine, Angiotensin converting enzyme inhibitors and zinc intranasally.(5)

4. Age

The evaluation of olfactory function is a crucial aspect of a typical clinical examination. It should be emphasized that the prevalence rates for olfactory impairment assessed by olfactory tests are much greater than those obtained just from questionnaires or patient verbal comments. Age-related olfactory system impairment is diagnosed using different types of olfactory tests which include psychophysical tests, scent perception, identification, discrimination, electrophysiological and psychophysiological testing. The odor loss in older adults is diverse,

with heavier compounds being more specific. Olfactory impairment has been linked to a variety of changes associated with age which occur in the nose, the olfactory epithelium, the olfactory bulb and higher brain areas, and structural changes in the ageing nose and olfactory system may explain the functional deterioration found in older people. There are other additional changes in the nose's non-olfactory constituents, Chronic infections, age-related nasal epithelial atrophy, a reduction in blood flow through the mucosa, airflow alterations, an imbalance of the sympathetic/parasympathetic mode of olfactory sensitivity, a depletion in cribriform plate foramina, impairment of mucociliary function, and so on. There are also alterations in the nose's olfactory components.

Changes in the olfactory system such as:

1) alterations to the olfactory neuroepithelium

(2) alterations in the OB, and

(3) It's important to consider alterations in brain regions involved in olfactory processing.(6)

5. Concomitant disease

a. Local

▪ Polyposis

▪ Seasonal rhinitis

▪ Allergic rhinitis

▪ Sinusitis

▪ Trauma

▪ Malignancy

b. Systemic

▪ Infections: viral, bacterial, fungal

▪ Endocrine: diabetes, Addison disease, Cushing syndrome, hypothyroidism

▪ Trauma

▪ Neurologic: epilepsy, migraine, multiple sclerosis, neurodegenerative diseases

▪Renal disease

▪Kidney disease

6. Drug induced

Drugs from all major pharmacological categories have the ability to change taste and smell function, and this happens more frequently than previously assumed. The illness often disrupts

sensory function at the molecular level, leading to two primary changes in the behavior: loss of visual acuity and/or auditory system failure. These changes can have an impact on appetite and food intake, as well as cause substantial lifestyle changes and the need to stop taking medications. Inhibition of receptor characteristics by drugs inactivates them via odorant receptor: (I) binding; (ii) guanine nucleotide-binding protein feature; (iii) inositol triphosphate feature; (iv) Sodium and calcium channel activity; (v) various inhibitory effects on receptors; or (vi) a few aggregate of those consequences are the most common causes of acuity loss. Distortions occur mostly as a result of a drug causing an unusually lengthy duration of receptor activity (i.e. routine receptor inactivation is no longer an issue) or no activation: (I) a variety of receptor kinases; (ii) Gi protein features; (iii)enzymes of cytochrome P450; or (iv) a variety of outcomes that (iv) turn off receptor features; (v) odorant receptor binding inactivation; or (vi) a blend of those outcomes. The end of medication treatment is usually associated with the end of taste/scent dysfunction, but sometimes symptoms remain and require careful treatment to alleviate symptoms. The overall goal of treatment is to restore everyday sensory receptor growth, improvement, and/or function. Zinc, theophylline, magnesium, and fluoride are used in a treatment that restores sensory acuity by correcting stages that start up receptors and diverse pathologies. Treatment for sensory distortions includes inhibitors of dopamine, γ-aminobutyric acid (GABA)stimulators, calcium channel blockers(CCB), and active anaesthetics which are orally administered, antiarrhythmic drugs, as well as biochemical inhibition of the receptor is reactivated, deactivation of stimulus receptor binding beyond of the place of stimulation, and/or rectification of many stages that initiate disease .(7)

Effects of anosmia

Anosmia is usually only recognized by its symptoms, which, like any disease or dysfunction, make research on the issue critical and beneficial. This section covers how anosmia affects people and how anosmia manifests itself.

1.Olfactory bulb volume

The volume of the olfactory bulb has been demonstrated to alter with the severity of olfactory dysfunction and that it lowers as olfactory loss progresses. Patients with a qualitative abnormality like parosmia have smaller olfactory bulbs than those who do not have parosmia. discuss current knowledge about the function of the olfactory bulb, practical options for measuring the volume of the olfactory bulb and the depth of the olfactory trough and report on systematic observations relating to these measurements in connection with a variety of olfactory abnormalities, such as upper respiratory tract infections, head traumas or disorders of the nervous system (8)

2.Intranasal trigeminal nerve

Most odors also stimulate the trigeminal nerve. As a result, even anosmia test subjects may distinguish odors based on their trigeminally mediated sensitivity. In order to investigate the trigeminal effect of stimulants without simultaneous olfactory stimulation, anosmia patients are frequently examined. Anosmia test subjects, on the other hand, have lower trigeminal sensitivity than healthy control subjects, implying that, in addition to the known mutual interactions between the olfactory and trigeminal chemosensory systems in healthy subjects, the presence or absence of a functional olfactory system influences trigeminal perception. The underlying mechanisms' anatomical and functional features are mainly unknown. The "Sniff in' Sticks" test

kit was used to examine olfactory function, whereas the NMP, tERP, intensity ratings of CO2 stimuli, and a lateralization task were used to assess trigeminal function.(9)

3.Emotional/psychological

Anosmia, or the inability to detect scents, can have serious psychological consequences, including feeling of physical and social weakness and deception. It's possible to acquire eating issues. Feelings of alienation from oneself, Patients' reactions included lack of appetite and emotional blunting, implying that we still have a long way to go before Anosmia-related difficulties are sufficiently understood by the general public and, more crucially, by the medical profession. Longer-term anosmia was found to result in more accurate fear and disgust recognition due to a reduced ability to recognize environmental threats in one investigation.(10)

4.Smell and taste

Things you can experience when you lose your sense of smell: inability to taste food, which can cause you to overeat or undereat; Inability to smell bad food; Can't smell smoke mood disorders like depression. Lack of interest in social situations, including not being able to enjoy food at a social gathering.(11)

Research on olfactory disorders and prospective treatment

1.Parosmia

This happens when olfactory receptor cells in your nose called olfactory sensory neurons fail to recognize smells and transmit them to your brain as they should. Usually the smell is bad or even gross. For example, when you smell a banana, instead of something fruity and pleasant, your nose may perceive a putrid smell like rotten meat. Parosmia often occurs after a viral infection. After upper respiratory tract infections (URTIs) or trauma, a considerable proportion of parosmia occur, followed by anosmia or hyposmia. Hyposmia and parosmia are more closely connected, implying that olfactory function in the olfactory epithelium and the OB is still intact.(12)Treatments for parosmia include: a nose clip to prevent odors from entering the nose, zinc, vitamin A, antibiotics.(13)

2.Steroids

Patients who are still anosmic after having their nasal polyps and sinuses removed might be given oral steroids, which increase their sense of smell. At the molecular level, more research is needed to understand why and also why oral steroids are used, but nasal steroids are not used. makes sense in these patients.(14)In non-steroidal anosmia, topical steroids had a considerable advantage, especially when budesonide was combined with neomycin. Early systemic steroids improved anosmia in both steroid-sensitive and non-steroidal patients.

3.Zinc treatment

Common cold can be treated by commercial zinc gluconate intranasal gel supplements. However reports have shown that anosmia is caused in humans and animals if zinc is administered intranasally. The zinc-caused anosmia syndrome, characterised through squirt, sniff, burn, and anosmia, which happens after the olfactory epithelium is exposed to zinc. Based entirely on history, it could be notable from anosmia due to post viral infections.(15-16)

4.Surgical procedures

The use of surgery to remove drainage enabled for the healing of inflammations, which allowed for the restoration of sign conduction pathways. It is the most common treatment for post-annoying anosmia or URTI. Surgery to remove blockages is now the most effective treatment option available to non-olfactory specialists.

Conclusion

The olfactory route for olfactory perception and neurogenesis in the olfactory bulb were examined in this review. Anosmia can be caused by genetic, physical, or chemical factors, as well as agenesis or comorbidities. The processes of parosmia can be studied to learn more about how anosmia develops. After all, zinc therapies, steroid medication, and olfactory training aren't guaranteed to work, and surgery is currently the most effective treatment for trauma and URTI patients. There isn't enough evidence to indicate that the treatment is effective. A greater understanding of chemical reactions is required, as well as signal and odor detecting pathways. Although people with olfactory impairment, such as anosmia, can learn to live with their condition, the anosmic community is very interested in anosmia remedies.

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