Effect of Osteopathic treatment on the post-covid loss of smell and taste.

Master of Science in Osteopathy

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Content

I. Introduction to the Effect of Osteopathic treatment on the post-covid loss of smell and taste.

Just before the beginning of the covid-19 pandemic I have taken part in one of the first courses about the approach to the brain given by the well-known and respected osteopath Jean-Pierre Barral. One of the things he taught us was to stimulate and treat the sense of smell and taste. When I learnt these techniques, at first I didn't think that these would be of any great use in my practice as I haven't treated anyone who would complain about a loss of smell or taste before.

I couldn't have been more mistaken. Only few months later my practice was full of patients suffering from post-covid syndrome. One of the long-lasting problems was, among others of course, the persistent loss of smell and taste or altered sense of smell and taste. I started to focus on their treatment using Barrals techniques and met very satisfying results. It was natural that I have chosen this problematic as the topic of my thesis as it was something exciting and new and the results were outstanding.

II. Sense of smell

a. Anatomy and physiology

The sense of smell is one of the eldest senses in the animal world. Babies for instance develop the sense of smell before the vision. In embryology, the olfactory tract is developed before the visual and auditory cortex. The main task of the sense of smell used to be the detection of danger, prey and opposite sex. Therefore, the sense of smell was indispensable for survival (Barral, Approche osteopathique du cerveau 2021).

To smell, the nose is imminent as the olfactory nerve fibers end in the structure of the nose.

The olfactory region is a specialized olfactory epithelium, which is localized on the cranial and lateral part of the nasal cavity and on the nasal septum in the area of the upper concha. It contains the olfactory receptor cells and glands (Hudák 2013).

The first cranial nerve – the olfactory nerve ends in the cribriform plate in the olfactory region of the nasal cavity. It is a perforated plate which contains the terminal branches of the olfactory nerve. These terminal branches function as receptors bringing their information to the olfactory bulb situated on the other side of the perforated plate. From there the information travels further into the brain.

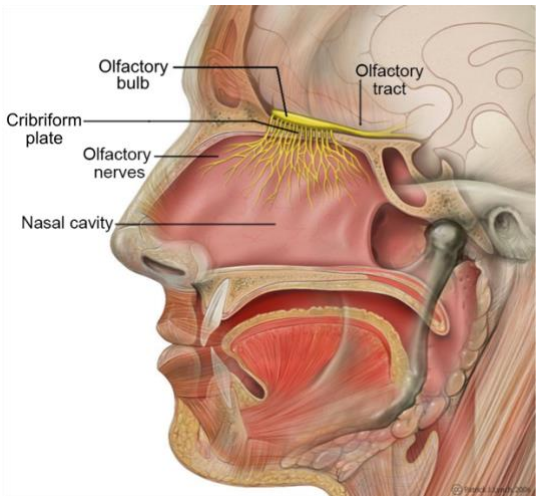

Figure 1 Nasal cavity with olfactory nerve (Lynch 2006)

The sense of smell means the ability to perceive a chemical substance diluted in water or air, usually in a very low concentration. It is then perceived either as a nice or bad smell (Barral, Approche osteopathique du cerveau 2021).
Being the shortest of the cranial nerves, the olfactory nerve receives the information from its terminal branches – the olfactory receptors. The information from these receptors gathers in the olfactory bulb. From there the information travels to the anterior olfactory nucleus and further on towards the primary olfactory cortex, the secondary olfactory cortex, the amygdala, hypothalamus and hippocampus.
Each nostril is connected to one olfactory bulb and smelling is analyzed at the same side of the brain. The olfactory bulb is a part of the limbic system, the seat of the emotions, desires and instincts. That is why there is a strong connection between a smell and an emotion, a memory, an emotional reaction (Barral, IAHP 2022).
The olfactory tract is a two-neuron uncrossed tract. It starts in the neuroepithelium of the olfactory cell where the terminal branches of CN I – the olfactory nerve receive information about the different smells perceived by the organ of olfaction. These axons travel to the olfactory bulb at the base of the frontal lobe. The second neuron is the mitral cell in the olfactory bulb. From there the axons run along the olfactory tract pathway towards the olfactory triangle (Hudák 2013).
The connections of the primary olfactory cortex according to Barral are:

- The fronto-orbital cortex considered as the secondary olfactory cortex
- The entorhinal cortex in connection with the hippocampus to memorise the smell
- The amygdala for the affection and emotions
- The insula for the visceral afference
- The anterior cingulate cortex, a part of the limbic system

According to the study realised by Zattore et al. from the University McGill in Montreal the right hemisphere is generally more active in the sense of smell and the odor activates particularly the right orbitofrontal cortex (Barral, Approche osteopathique du cerveau 2021).

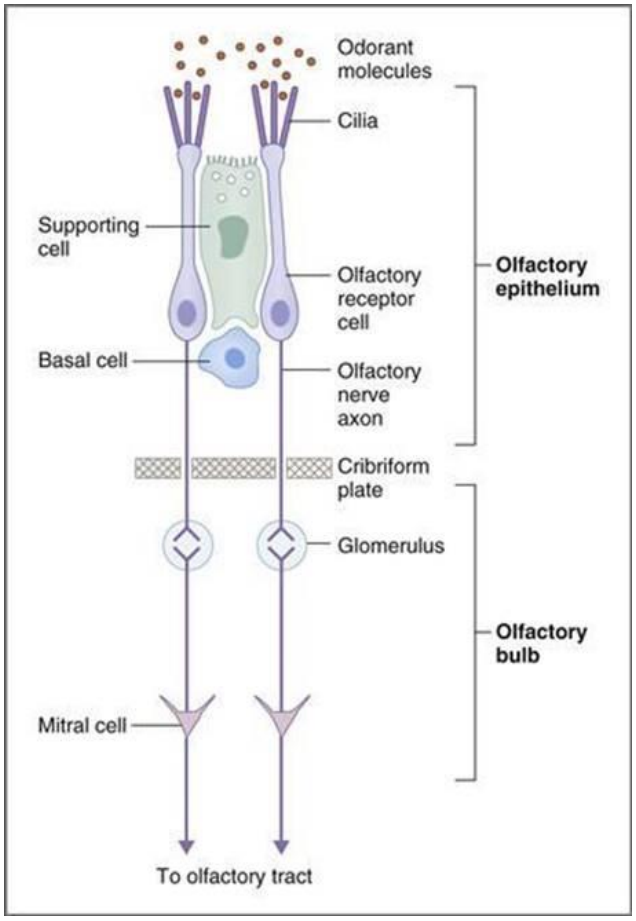

Figure 2 The olfactory tract (Physiology 5th Ed. OLFACTION n.d.)

b. Pathology

The objective olfactometry is a way of assessing the ability to smell a fragrance. It is performed with only one nostril at a time, eyes closed (Hudák 2013).

There are various forms of inability to smell.

- A complete loss of smell is called anosmia. It can be either permanent (e.g., after car accidents) or temporary. The cause can be an inflammation of the nasal mucosa, blockage of the nasal passages or destruction of one of the temporal lobes. When there is a smell of quartz, a smell of something burnt the prognosis of regaining one's sense of smell is diminished (Barral, Approche osteopathique du cerveau 2021). We can confirm this from our treatment results. Anosmia gets definitive after three years. Patients with chronic rhinitis or sinusitis often struggle to find an appropriate help and as it is not yet so well known that the osteopathic treatment can be beneficiary, they come to our practice years after the appearance of the first symptoms. This is not the case of post-covid smell loss as it is a new type of disease.

- A considerable reduction of one's ability to smell is called the hyposmia. It is usually due to aging, sometimes it is the first sign of a neurodegenerative disease such as the Alzheimer's or Parkinson's. Therefore, we need to be vigilant with elderly patients and recommend a neurological examination if there is hyposmia.
- There can also be a stronger sense of smell called the hyperosmia.
- When a patient smells something else than the presented fragrance, it is referred to as a parosmia.
- Cacosmia is a state in which a patient smells all odors as the smell of stools.

As we will later find out, in post-covid patients we can find all the pathologies stated above (Barral, Approche osteopathique du cerveau 2021).

c. Post covid loss of smell

In this case the reason why some people have altered sense of smell or one of the forms of dysosmia or complete anosmia seems to be an inhibited action of olfactory receptors, proteins on the surfaces of nerve cells in the nose that detect the molecules associated with odors. It appears to reduce the activity of genes needed for the building of olfactory receptors as if the body was unable to stop the immune signaling in the brain (Williams 2022).

In some patients the onset of the loss or alteration of smell can be delayed after the Covid-19 infection.

Following Covid-19 around 7% of patients can remain anosmic (Karamali, Elliott and Hopkins 2022).

III. Sense of taste

d. Anatomy and physiology

The taste organ is the tongue. To perceive different flavors, it is equipped with gustatory papillae that contain among other structures the taste buds with receptor cells. The taste and smell receptors are very much alike.

The gustatory receptor cells are also present on the soft palate, posterior wall of pharynx, in the glossoepiglottic plicas and in the mucous membrane of the epiglottis.

We distinguish five different tastes. According to Hudak these are: sweet, sour, salty, bitter and umami (Hudák 2013). Barral states that these five tastes are sweet, salty/umami, sour, bitter and spicy (Barral, Approche osteopathique du cerveau 2021).

To separate the sense of taste from the sense of smell is only very theoretical. In fact, about ¾ of what the brain perceives thanks to the sense of taste, also relates to the sense of smell. The taste depends on the smell, the tongue and the mouth etc.

The sensory information from the tongue is gathered through three cranial nerves: CN VII – facial nerve (through the lingual nerve) gathers sensory information from the back of the tongue – the dorsum linguae. The root of the tongue is innervated by the CN IX – the glossopharyngeal nerve. Further down towards the throat, the vagus nerve – CN X takes its place. That is why the vomiting or pharyngeal reflex can be triggered when touching this area of the tongue (this area is also under the sensitive innervation of the CN X and when the CN X is irritated one of the symptoms is nausea).

When we compare the figure 3 and 4, we can see which nerve is present in which area of the tongue and in which areas different tastes are perceived. One of the most altered tastes in post-covid patients is the bitter taste. It is perceived in the posterior area of the tongue not far from its root.

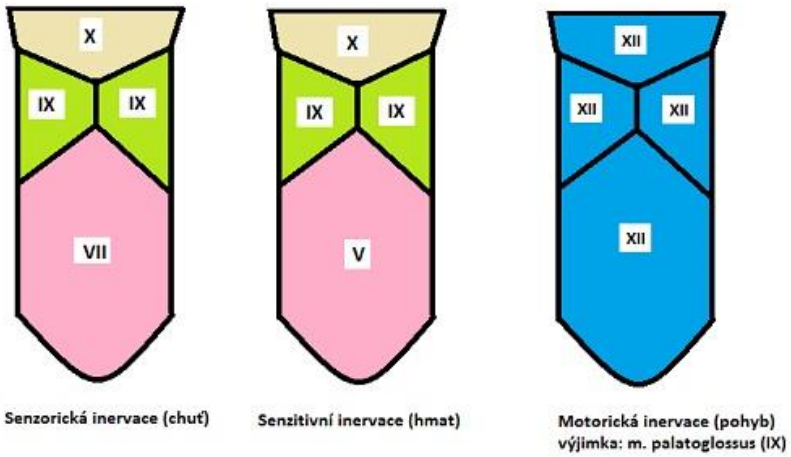

Figure 3 Innervation of the tongue – sensoric (taste), sensitive (touch) and motor innervation (motion) (Medlicker n.d.)

Figure 4 Taste areas of the tongue (istockphotos n.d.)

The gustatory tract is a three-neuron pathway which starts in the contact of CN VII, IX and X with the taste buds from where it travels towards the second neuron – the gustatory nucleus which is a part of the solitary nucleus in medulla oblongata. The third and final neuron is represented by the cells of the ventral posteromedial nucleus in the thalamus. Its axons travel to the cerebral cortex into the insula where the gustatory tract terminates as you can see on the figure 5 below (Hudák 2013).

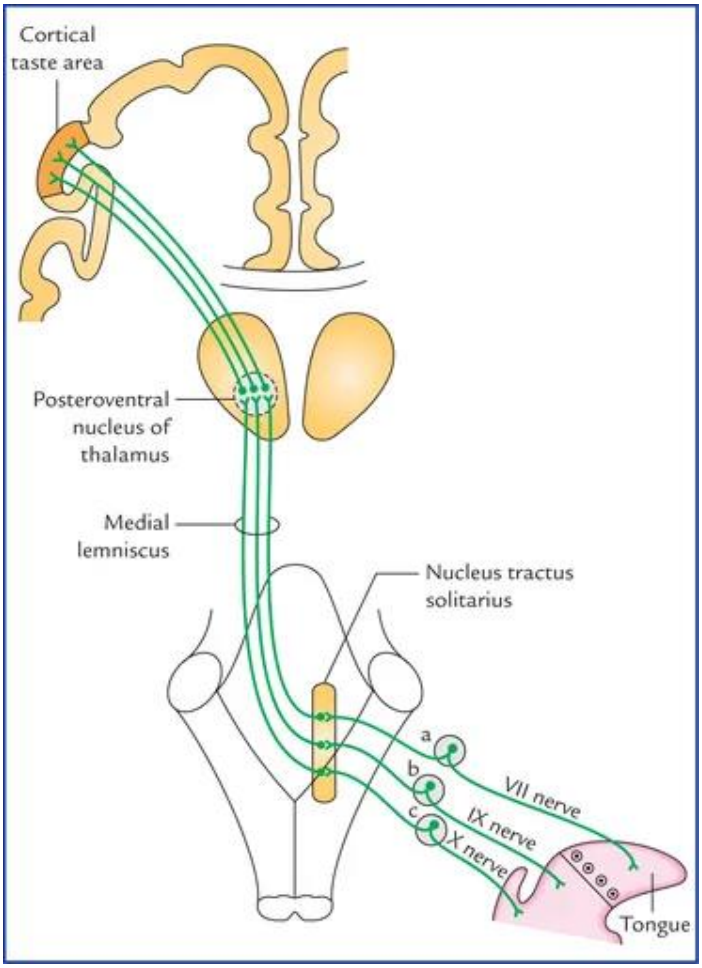

Figure 5 Gustatory pathway (neupsykey.com n.d.)

e. Pathology

According to Barral (2021) the alteration of the sense of taste can be due to the following:

- Traumatic, associated with the loss of smell
- Inflammatory – the result of a rhinitis or a flu, a post-covid syndrome
- Degenerative – the elderly people tend to lose a part of the sense of smell and taste
- Demyelination as seen in the MS, Parkinson's and Alzheimer's disease
- Emotional

Different forms of gustatory abnormalities are:

- Hypogeusia – it is a reduced ability to taste things
- Dysgeusia is a distortion of the sense of taste, a transformation of the sense of taste concerning the alcohol and tobacco intake, chemotherapy, radiotherapy and the diabetes

- Presbygeusia relates to the elderly people
- Frontogeusia – bitter taste in the mouth in connection with the affection of the tympan which creates an irritation of the chorda tympani (a part of the CN VII – facial nerve)

Both the sense of taste and smell can be diminished in patients with depression and hepatobiliary pathologies (Barral, Approche osteopathique du cerveau 2021).

f. Post covid loss of taste

The etiology of the post covid loss of taste is connected to the loss of smell (Barral, Approche osteopathique du cerveau 2021), but usually it tends to recover more quickly. From my observation, it is often the bitter taste that seems to be the most problematic.

IV. Osteopathic approach to the loss of smell and taste

g. Osteopathic approach

An osteopathic approach is always holistic. Therefore, general and local listening is taken, and the somatic dysfunction is assessed and treated. It is very important to point out that in case of loss of taste and smell, it is imminent to take the cranial listening and of course to stimulate the mentioned senses and to test them. Only this way we can be maximally precise in our treatment and hope for the best results.

h. Exam

The patient is lying supine on the table. We let the patient smell, for example mint or eucalyptus while performing cranial listening on the brain. Smelling brings us to the:

- olfactory bulb
- olfactory tract
- olfactory cortex
- amygdala
- hippocampus

While the patient is smelling with both nostrils, we can evaluate which side is dominant. Then we perform the same test but only letting the patient breathe with one nostril. We ask the patient about his or her subjective feelings, whether there is a smell or not and whether there is a burning sensation in the nasal passages (if we use eucalyptus or mint).

Figure 6 Ttesting the sense of smell (Barral, IAHP 2022)

Consequently, we can perform the treatment. Thanks to this initial test we know which side of the brain is dominant, whether the patient suffers from anosmia, hyposmia or parosmia. In any case the treatment always respects and follows the listening.

To examine the sense of taste, we use the same test, only adapted for the gustatory tract so that we can evaluate whether the patient suffers from a hypogeusia, ageusia or dysgeusia.
Patient is lying supine; different tastes are being administered on his tongue while we take the listening. As we can see on the picture below, we administer different tastes to different areas of the tongue in order to get maximal response.

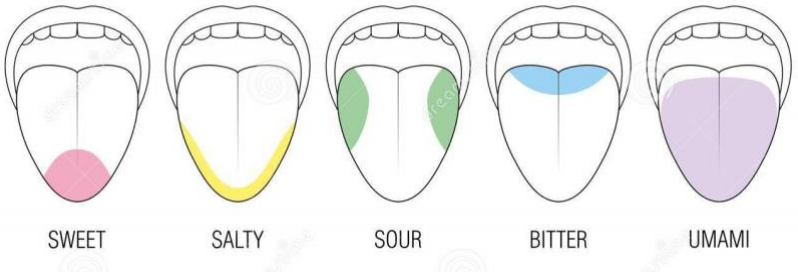

Figure 7 Taste areas of the tongue (Furian n.d.)

For the sweet taste, sugar dissolved in water was dropped on the tip of the tongue, then salt solution was poured on the sides of the tongue, for sour taste we used lemon juice in the posterolateral parts of the tongue and finally for the bitter taste grapefruit or coffee was used and dropped on the back/root of the tongue.
After each administration listening was taken in order to determine which taste was the most problematic.
After the treatment (as explained in the next chapter) the olfactory and gustatory tracts are retested and re-evaluated (Barral, IAHP 2022).

i. Treatment

The treatment for the loss of smell and taste comes from the teachings of Jean-Pierre Barral. It was first taught just before the outspread of the covid pandemic as Barral started to teach the brain techniques in 2019.
The principle and the course of the treatment is the same for both senses. The only but a very important difference is the stimulation. Working with the structures of the brain is very specific because unlike other organs, the brain is so complex and complicated in its activity that it needs proper stimulation. One of the reasons why this is necessary is that one part of the brain – e.g., amygdala can be responsible or connected with various functions. Therefore, we need to be clear in sending the right message to the brain in order to be able to get the desired response. Only this way, the treatment can be precise and efficient. Barral has always pointed out that we need to work with maximal precision and minimal strength to meet the results. Nevertheless, it is important to note that this is not a part of craniosacral therapy where the pressure is featherlike. To reach a structure of the brain the pressure needs to be stronger than in CST but never painful nor unpleasant, only intense and very precise. We always work with both of our hands and thorax. We can also use a dental roll to make the patient bite into it and increase the pressure during the technique (Barral, IAHP 2022).

Once the function of a sensory organ is tested, we proceed to the treatment.
The technique is done right after the testing while the olfaction is still “on” and stimulated.
First, we treat the non-dominant side with tonifying compression/decompression approach. Then we treat the dominant side where the listening was initially going. We always use both hands and thorax for the induction. We recheck the listening without stimuli and compare with initial listening. Then we stimulate the sense again and we also compare it to the beginning of the treatment.
We can also use a dental roll to enhance the treatment as we explained earlier.
We ask the patient to bite on the dental roll on the same side where we are working. This accentuates the listening and the induction – the treatment. We use both hands and thorax.

Figure 8 Olfactory treatment using a dental roll (Barral, IAHP 2022)

V. Case study

j. Treatment of the loss of smell and taste

The treatment of all these patients was as explained in chapter IV. I have always followed the listening and treated other structures as well, but the specific work on the brain was always according to the explained procedure. Usually, I had to repeat the treatment more than once, there were about 3 – 5 weeks in between the therapies.

As you will see, not all the treatments were the same as I was getting more skilled and precise in performing the techniques. Especially the treatment of the loss of taste evolved and became more precise and specific when I started to use different tastes in order to determine which taste was diminished and which was normal.

k. Patients with the loss of smell and taste

1) A.K.

- *Age:* 39
- *Gender:* Female
- *Covid-19 infection:* October 2020
- *Date of first treatment:* December 2020
- *Vaccination* - 2 doses administered during autumn 2021
- Post covid loss of smell and taste
- Loss of taste only during acute phase of covid, spontaneous recovery
- *Main complaint*: thorax and thoracic spine, gastroesophageal reflux, tinnitus

Smell

Weaker side: left

Dominant side: right

Taste*:*

Weaker side: left

Dominant side: right

- *Frequency of therapies:* 2 weeks

- *Recovery of smell*: The smell was quite reluctant to return. After the first treatment of the sense of smell only the pleasant smells were regained. The patient couldn't smell sweat, stools or chemicals.

  As the loss of smell was not the main complaint of this patient, we didn't work on it in every therapy. The smell was completely regained 4-5 months after the first treatment. In total the stimulation of the sense of smell was done 3 times.

2) I.H.
   - *Age:* 50
   - *Gender:* Female
   - *Covid-19 infection:* March 2021
   - *Date of first treatment:* May 2021
   - *Vaccination* - 2 doses administered before the treatment begun
   - *Main complaint:* Post covid loss of smell

Smell

Weaker side: left

Dominant side: right

- *Recovery of smell* – complete recovery after 1 therapy

3) P.M.
   - *Age:* 32
   - *Gender:* Female
   - *Covid-19 infection:* October 2021
   - *Date of first treatment:* March 2021
   - *Vaccination* - no
   - Post covid loss of smell and taste
   - *Main complaint*: loss of smell, loss of taste (partially regained spontaneously but altered, connection to the loss of smell)

Smell

Weaker side: left

Dominant side: right

Taste*:*

Weaker side: right

Dominant side: left

Stimulated taste: sweet

After treatment: symmetry in listening (compared to initial listening)

- *Frequency of therapies:* 3 - 4 weeks
- *Recovery of smell:* after 5 treatments
- *Recovery of taste:* after 2 treatments

- Post covid loss of smell
    - Partial recovery after 5 therapies, some smells remain altered, complete recovery after 7 therapies
- Post covid loss of taste
    - Complete recovery after 3 therapies

4) M.T.
    - *Age:* 17
    - *Gender:* Male
    - *Covid-19 infection:* August 2021
    - *Date of first treatment:* September 2021
    - *Vaccination* – in time of treatment no
    - Post covid loss of smell and taste
    - *Main complaint*: loss of smell, loss of taste

Smell

Weaker side: left

Dominant side: right

Taste*:*

Weaker side: right

Dominant side: left

The weakest taste: bitter, salty

After treatment: symmetry in listening (compared to initial listening)

- *Frequency of therapies:* only one therapy so far
- *Recovery of smell:* partial after 1 treatment
    - After the therapy – his smelling got much better, patient says about 50%, unfortunately he got reinfected, haven't had the chance to treat him since
- *Recovery of taste:* complete after 1 treatment

5) A.K.

- *Age:* 29
- *Gender:* Female
- *Covid-19 infection:* March 2021
- *Date of first treatment:* July 2021
- *Vaccination* – not in the beginning of the treatment, first dose administered in September 2021
- Severe post covid loss of smell and taste
- *Main complaint*: loss of smell, loss of taste

Smell

Weaker side: left

Dominant side: right

Taste*:*

Weaker side: left

Dominant side: right

The weakest taste: bitter, the strongest were sour and salty

After treatment: symmetry in listening (compared to initial listening)

- *Frequency of therapies:* 2 – 3 weeks
- *Recovery of smell:* complete after 4 treatments
- *Recovery of taste:* partial after 7 treatments

- Post covid loss of smell
    - Recovery to 9/10 after 4 therapies
- Post covid loss of taste
    - Partial after 7 therapies, the bitter taste remains problematic

6) A.P.

- *Age:* 38
- *Gender:* Female
- *Covid-19 infection:* March 2021
- *Date of first treatment:* August 2021
- *Vaccination* – 2 doses
- Post covid loss of smell and taste (regained spontaneously)
- *Main complaint*: loss of smell

Smell

Weaker side: left

Dominant side: right

Taste*:*

Weaker side: left

Dominant side: right

Treating the taste improved the ability to smell.

After treatment: symmetry in listening (compared to initial listening)

- *Frequency of therapies:* 4 weeks
- *Recovery of smell:* after 3 treatments

7) M.S.

- *Age:* 29
- *Gender:* Female
- *Covid-19 infection:* November 2020
- *Vaccination* – no
- *Date of first treatment:* June 2021

- Post covid loss of smell (no smell loss during covid, it only came 2 months after the end of acute infection, altered sense of taste)
- *Main complaint*: stomachache, frequent urinary infection, loss of smell, chronic sinusitis

Smell

Weaker side: right

Dominant side: left

Taste*:*

The two sides were almost symmetrical

After the technique for the sense of taste, the smelling got better

Taste stimulated: sweet

After treatment: symmetry in listening (compared to initial listening)

- *Frequency of therapies:* 2 weeks
- *Recovery of smell:* after the first therapy the sense of smell got better, it was completely normal after 3 treatments
- *Recovery of taste:* after 1 treatment

8) K.M.

- *Age:* 47
- *Gender:* Male
- *Covid-19 infection:* end of November 2021
- *Date of first treatment:* December 2021
- *Vaccination* - no
- Post covid loss of smell and taste
- *Main complaint*: loss of smell and taste

Smell

Weaker side: left

Dominant side: right

Taste*:*

Weaker side: left

Dominant side: right

The weakest taste: bitter

After treatment: symmetry in listening (compared to initial listening)

- *Frequency of therapies:* only one treatment was sufficient for the recovery of smell and taste

9) E.M.
   - *Age:* 13
   - *Gender:* Female
   - *Covid-19 infection:* end of November 2021
   - *Date of first treatment:* December 2021
   - *Vaccination* - no
   - Post covid loss of smell and taste
   - *Main complaint*: loss of smell, loss of taste (regained but altered, connection to the loss of smell)

Smell

Weaker side: left

Dominant side: right

Taste*:*

Weaker side: right

Dominant side: left

The weakest taste: bitter

After treatment: symmetry in listening (compared to initial listening)

- *Frequency of therapies:* 2 – 3 weeks
- *Recovery of smell:* after 3 treatments
- *Recovery of taste:* after 2 treatments

VI. Conclusion

To conclude the results and findings of this thesis, it seems important to point out that the testing of the olfactory and gustatory tracts revealed that in most cases the dominant side was the right side, and the weaker side was the left side. It corresponds with the general listening present in post-covid patients which is showing the somatic dysfunction in the left side of the body.

For the case study of this thesis, we have chosen nine patients with post-covid loss of smell and taste. The average amount of treatments to regain the sense of smell and taste was 3 therapies and in almost 70% the sense of smell was recovered completely, the remaining 30% of cases benefited from a partial recovery of smell. You can see the results in the table 1 below.

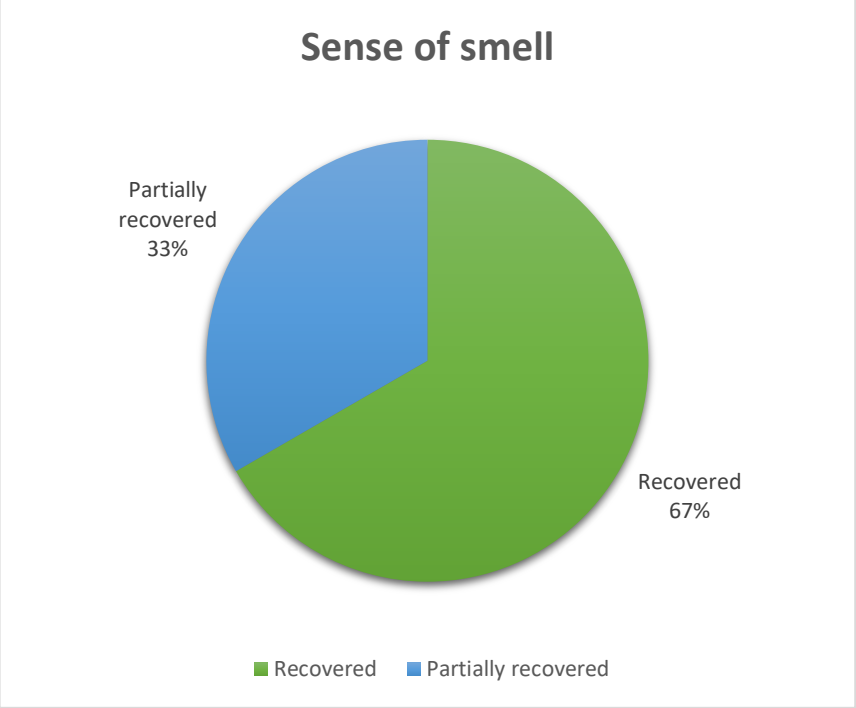

Table 1 Results of the treatment for the sense of smell

In the table 2 below you can see a chart showing the results of the treatment for the sense of taste. The sense of taste was not affected in all cases, but when affected, the recovery rate was around 80%.

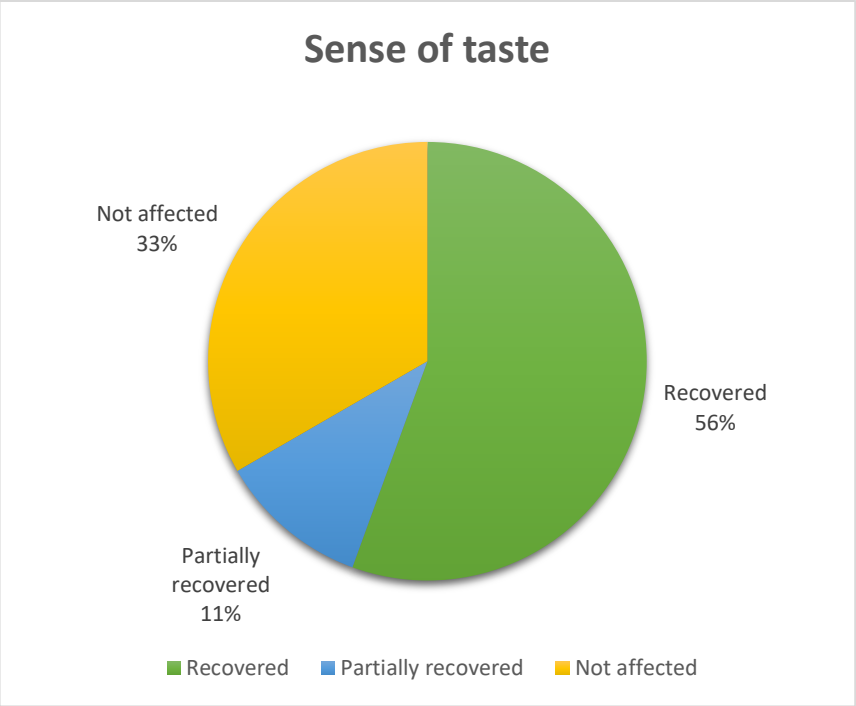

Table 2 Results of the treatment for the sense of taste

The complete outcome of all the therapies is summed up in the final chart. In my point of view the treatment was efficient and we managed to improve or resolve the symptoms of post-covid loss of smell and taste as you can see in the table 3.

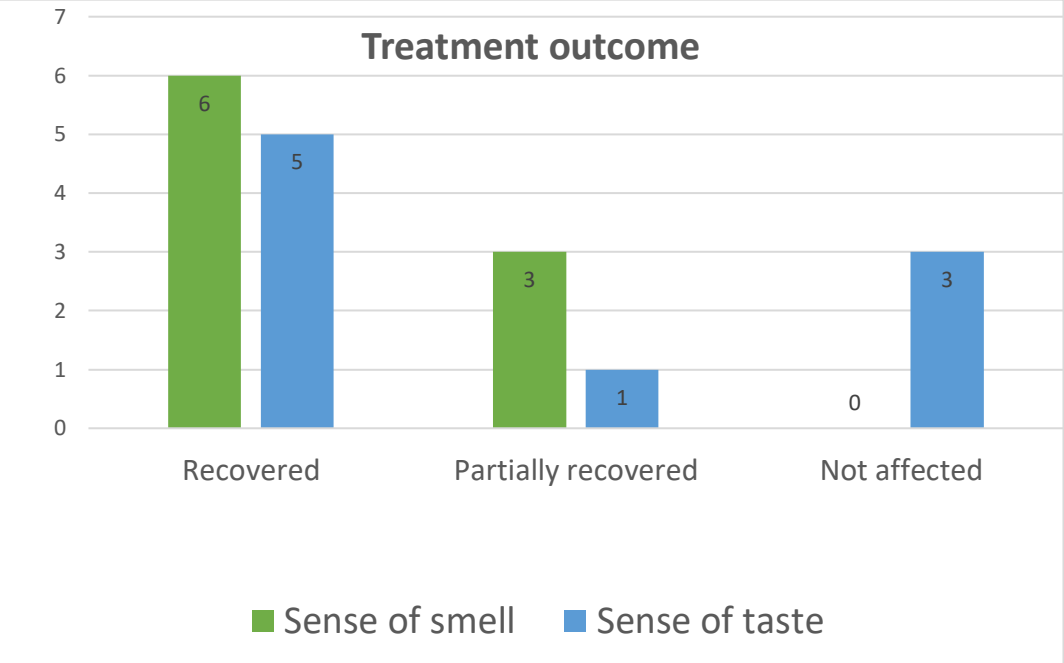

Table 3 Treatment outcome and comparison of the results

VII. Bibliography

n.d.

Ambler, Zdeněk. 2011. *Základy neurologie.* Praha: Galen.

Barral, Jean-Pierre. 2021. *Approche osteopathique du cerveau.* Issy-les-Mulineaux: Elsevier Masson.

—. 2022. *IAHP.* 02 11. Accessed 04 16, 2022. https://www.iahp.com/pages/microsite/materials/docs/avmtb/10-Sense-of-Smell.pdf.

Furian, Peter Hermes. n.d. *Dreamstime.* Accessed 04 17, 2022. https://thumbs.dreamstime.com/z/human-tongue-five-taste-areas-bitter-sour-sweet-salty-umami-perception-colored-division-zones-different-buds-107636696.jpg.

Hudák, Radovan. 2013. *Memorix anatomie.* Praha: TRITON.

n.d. *istockphotos.* Accessed 04 17, 2022. https://media.istockphoto.com/vectors/taste-areas-of-the-human-tongue-colored-division-with-zones-of-taste-vector-id904991434.

Karamali, Katerina, Michael Elliott, and Claire Hopkins. 2022. "COVID-19 related olfactory dysfunction." *Current opinion in otolaryngology & head and neck surgery vol. 30* 19-25.

Lynch, Patrick J. 2006. "Head anatomy with olfactory nerve, including labels for the nasal cavity, olfactory nerves, cribriform plate, olfactory bulb, and olfactory tract i." *Wikipedia.* 12 27. Accessed 04 16, 2022. https://en.wikipedia.org/wiki/Olfactory_system#/media/File:Head_Olfactory_Nerve_Labeled.png.

n.d. *Medlicker.* Accessed 04 17, 2022. https://medlicker.com/files/2012/12/04/motoricka-inervace-jazyka-1354619775-08a5237b.jpg).

n.d. *neupsykey.com.* Accessed 04 17, 2022. https://i2.wp.com/neupsykey.com/wp-content/uploads/2017/01/B9788131223079500188_gr21.jpg?fit=370%2C511&ssl=1.

n.d. *Physiology 5th Ed. OLFACTION.* Accessed 04 17, 2022. https://doctorlib.info/physiology/physiology-2/22.html.

Williams, Greg. 2022. *NYU Langone Health.* 02 02. Accessed 04 16, 2022. https://nyulangone.org/news/mechanism-revealed-behind-loss-smell-covid-19.

VIII. List of figures

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