

Palestinian German Congress
in Dental Sleep Medicine & Temporomandibular Disorders
FRIDAY 29 March 2019

Oral appliances for the treatment of sleep apnea

Let me tell you about the history of the devices:

1984 Meier-Ewert: Esmarch-Orthese
Prof. Meier-Ewert, Dr. Schäfer, Kloss,
Treatment of sleep apnea by a mandibular protracting device
In: Proceedings of the Seventh European
Congress on Sleep Research; Munich, 1984: 217

Prof. Dr. Maier-Ewert,
Facharzt für Neurologie und Psychiatrie



1988
variable Protrusion
Klearway
Prof. Alan Lowe



Dr. Volker Hugendubel

Soon after the invention of the CPAP therapy by Dr. Colin Sullivan, oral appliances were invented by Prof. Meier-Ewert, a German professor in sleep medicine and a dentist, Dr. Schäfer.

With the help of this device the mandible could be moved forward. It was called Esmarch Orthese

So, the airway space is extended during sleep and permanently kept open.

Prof Meier-Ewert made monobloc devices, similar to the orthodontic activator.

Nowadays we use systems with two separate devices.

These two parts have a mechanical connection.

With the help of this connection, we can get different sagittal positions of the mandible.

When we speak of THE device, we always mean a device, which is made of two parts.

To be correct, we should speak of a system of devices. The mechanism between the two devices can be differently positioned: anterior, lateral, oral or interocclusal.

A meta-analysis has shown that not one laboratory made system is more effective than others. (Ahrens et al. 2011). What is clear however, that devices with two pieces are more effective than monoblocs, which are nearly not being used anymore.

**effective oral appliances
for long term treatment**

- are incorporated by specialised dentists
- are individually produced by specialised laboratories
- are adjustable in individual positions
- allow movement of the mandible

Dr. Volker Hugenbuehl

There are some essentials for modern oral appliances:

→ They have to be incorporated by specialized dentists

First, we comprehensively explain the pros and cons of the treatment.

Then we check the conditions for the integration.

We are responsible for the correct manufacturing and incorporation
And we are responsible for the qualified after-care.

- The appliances have to be individually manufactured by specialized laboratories
Our devices must have a good retention on the teeth.
Some systems use a combination of two materials, hard outside and soft inside.
This is comfortable for the patients.
As a result, we also get an equal distribution of pressure on the teeth.

There are industrial prefabricated devices, so called boil and bite devices, which can be adjusted by the patients themselves.

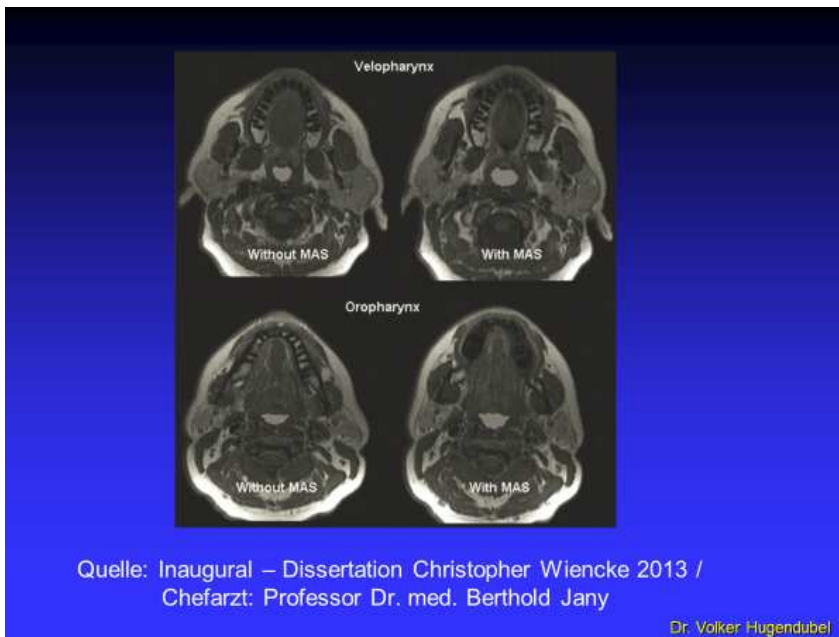
They are made to be adjustable to every jaw. But not all jaws are the same.

They can be big or small, slim or broad. "One size fits all" cannot work.

Beside this, these devices are customized with thermoplastic material. With time, this material will lose retention.

In my opinion these devices are not comfortable for the patient and I am in doubt, weather they are suitable for a good long-term treatment.

- oral appliances must be adjustable in individual positions
Every patient needs a different sagittal position for a successful therapy
- and last but not least oral appliances have to allow movement of the mandible
This is necessary for good comfort of the patient
and to prevent side effects on the jaw joints or on the teeth



Here you can see the effect of oral appliances.

See MRT images of the Velopharynx and the Oropharynx.

On the left side you see it without, on the right side with a device.

You can see the extension is not only in the anterior posterior direction, but also in lateral direction.

S3 Guideline DGSM
Deutsche Gesellschaft für Schlafmedizin
2017

Mandibular advancement devices can be used for patients with

- light to medium obstructive sleep apnea AHI < 30 BMI < 30
- heavy obstructive sleep apnea if CPAP doesn't work or if the patients have an intolerance against CPAP
- habitual snoring

Dr. Volker Hugendubel

When do we have an indication for mandibular advancement devices?

There are guidelines of the DGSM, the German society of sleep medicine

Oral appliances can be used for patients with

- light to moderate obstructive sleep apnea, with an AHI under 30 and BMI under 30

- They can also be used for patients with heavy obstructive sleep apnea, if CPAP doesn't work
- or if the patients have an intolerance against CPAP.
- and of course, they can be used for patients with habitual snoring

It can happen that either therapy alone, CPAP or the oral appliance, is not effective enough. In this case, both therapies can be applied at the same time.

So, for example, the CPAP pressure can be kept low.

The integration of devices requires a good number of teeth. The patient at least should have 8 to 10 healthy teeth, parodontal strongly fixed in the jaw.

Implants work as well.

Before planning a device, we need an exact sleep diagnosis by a sleep doctor or by a sleep laboratory.



Polygraphy or Polysomnography are indicated.

Sometimes a patient wants a device only because of the disturbing snoring and would like to skip the pre diagnosis. But probably he also has sleep apnea.

Without a polygraphy, we don't know, if he or she has sleep apnea.

The patient will be satisfied, if we successfully cure the snoring. But he might still have sleep apnea. Because snoring and sleep apnea don't disappear at the same time, will say in the same position of the device.

So, the only way to be sure that the therapy is successful, also regarding the sleep apnea, is a pre- and post polygraphy.

First step in manufacturing the appliance is a construction bite.

There are many different instruments to do this.

For example, the George gauge, the IST bite fork, the SomGauge and many others

The main question is: in which position shall the mandible be fixed?

Actually, the recommendation is to fix the mandible in a position 60 % of the maximum possible protrusion.

I did this for a long time. Over time, I changed my mind.

I came to the conclusion, that I prefer to fix the mandible in a more moderate position near the habitual occlusion.

Just to be clear again, this is not the prevailing opinion, this is how I think it works best.

The reason why I prefer this way of fixing the mandible is this:

Many of my patients have already been through a CPAP therapy. They had stopped the CPAP, because they could not deal with it, they could not get used to it.

Now I don't want to start the next therapy with problems again.

Therefore, my first intention is to provide the patients with a device they feel comfortable with. For me, the wearing of a device free of problems is the first step for a successful therapy.

I leave the bite gauge approximately one minute in the mouth of the patient.

Then I ask him how it feels. If he likes this position, I fix it with bite compound.

If not, I go back and try again, until the patient does not feel disturbed by the position of the mandible.

This practice makes sense also because of another reason:

The bigger the protrusion, the bigger is the reciprocal power on the teeth and the possibility of side effects. (Cohen-Lew J. et al, 2013).

Therefore, I want to work with as little protrusion as possible.

In my opinion the protrusion shall be: **as much as necessary and as little as possible.**

When I started this kind of bite registration in moderate adjustment, I was quite surprised: some patients had been told by their partners that they had stopped snoring.

Others told me, that they felt much better in the morning. And this effect could be verified by polygraphy.

How could this be? We had learned to move the mandible in a position 60 % of the maximum possible protrusion. And now it seemed to work with little or no protrusion?

But is right. In some cases, it does indeed work with little or no protrusion, a fact that has been verified by polygraphy or polysomnography.

Sometimes it is enough, if we prevent the falling back of the mandible.

For other patients, those for which the effect does not happen that easily, I first establish a comfortable position and ensure that there are no problems in wearing the device, before I continue.

In order to find the correct therapeutic position, the mandible has to be moved forward slowly, in small steps. This procedure is called titration.

I explain to my patients how they can adjust the device themselves to a more and more forward position.

Many of my patients don't live near my surgery. It is not necessary to take a long trip just to do these little changes. They can do it easily at home. If there are any questions, they can call me.

Which criteria do patients have to adjust the system?

Snoring and daytime tiredness are two easily detectable criteria. Patients with these symptoms should titrate till the symptoms are gone.

It is more difficult for patients, who do not snore or who have no partner observing the snoring. These patients can record their snoring with an app for smartphones, for example SnoreLab.

Also patients, who don't suffer because of the sleep apnea, have no criteria how far they shall protrude the mandible. These patients should do polygraphy several times until the right therapeutic position is found.

In such cases a pulsoximeter, which is not very expensive, could give a hint. BUT the right position of the system always has to be verified by polygraphy or polysomnography.

Also, an annual control of the therapy by polygraphy is indicated.

As I just explained, with this procedure and the instrument of oral appliances we can offer patients a good treatment of sleep apnea or snoring.

To conclude, I would just repeat that we can get good results, when there are three components working well together:

- a doctor who is familiar with dental sleep medicine
- a dentist specially trained in general sleep medicine and in dental sleep medicine
- and a specialized laboratory to manufacture the appliance

