

# Er:YAG Laser Treatment of Sleep-Disordered Breathing

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## ABSTRACT

Recently a new method (NightLase) for the treatment of snoring and obstructive sleep apnea that uses the benefits of Er:YAG laser light was presented. To test the method, the results of treatments on 75 patients with different degrees of snoring and obstructive sleep apnea were analyzed. The outcome of the treatment was very beneficial for the patients and the success rate after three treatments was 90%. More than 80% of the patients also reported that they breathed much easier, being more alert and focused. Our clinical study confirms that NightLase treatment is an efficient method for significant snoring reduction. The treatment is quick and easy to perform, minimally invasive, doesn't require any anesthesia or post-operative therapy and has an extremely high success rate in producing a positive change in sleep patterns.

**Key words:** Er:YAG, NightLase, snoring, obstructive sleep apnea.

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## I. INTRODUCTION

Snoring is a common problem and studies estimate that 45% of men and 30% of women snore on a regular basis and that just about everyone snores occasionally [1]. Snoring occurs when the flow of air through the mouth and nose is physically obstructed. It can be caused by a combination of factors including obstructed nasal airways during allergy seasons or sinus infection, deformities such as a deviated septum, nasal polyps, poor muscle tone in the throat and tongue, bulky throat tissue, large tonsils and adenoid, or a long soft palate or uvula [2-5].

Most people don't think of snoring as something to be overly concerned about. While loud disruptive snoring is at best a social problem that may strain relationships, for many men, women and even children, loud habitual snoring may signal a potentially life threatening disorder [6-8]. Habitual snorers can be

at risk of serious health problems, including sleep deprivation, lack of focus and decreased libido, psychological and social damage, irritability and obstructive sleep apnea (OSA) that may result in daytime somnolence, morning headaches, automatic behavior, mood alterations, sexual dysfunction, short-term memory loss and hallucinations [9-12]. Sleep apnea syndrome also significantly increases the risk of stroke or death from any cause [8, 13].

There are many options of snoring and OSA treatment [8, 9]. In some cases it is possible to treat it with lifestyle changes like diets, exercise, reduction of smoking or alcohol intake and changing the sleeping position [14-17]. Some people also use oral or dental appliances that open upper airways [18]. For more severe cases, doctors usually proscribe a Continuous Positive Airway Pressure (CPAP) device, which provides a constant flow of air into the mouth and nose so that the patient can breathe more easily during sleep [19]. Among other non-surgical snoring therapies, there are also oral tablets or nasal sprays containing different pharmaceuticals [20]. To treat more severe cases of snoring and apnea, different surgical procedures are available. Some of them are less invasive like the pillar procedure, the injection snoreplasty procedure, various radiofrequency procedures, laser-assisted uvulopalatoplasty (LAUP) and radiofrequency tissue volume reduction (RFTVR) [21-23]. Others like uvulopalatopharyngo-plasty (UPPP) require general anesthesia [24].

Most of these treatments have many limitations like low and unpredictable success rates (UPPP, medication, weight reduction), patient noncompliance (CPAP), inconvenience (tracheostomy, CPAP), cost (UPPP, pillar procedure), discomfort (CPAP, reconstructive surgery), post-operative pain (reconstructive surgery), foreign body sensation (pillar procedure), partial extrusion and side effects like dry mouth, nasal congestion, skin irritation, nightmares, and scarification (CPAP, pharmaceuticals, reconstructive surgery) [25-28]. But the biggest limitation for the patient is that most of the treatments have a nonpermanent effect which requires repetition of the procedure [26].

Recently a new minimally invasive and more effective method for the treatment of snoring and

apnea known as NightLase was presented [29-31]. Since we are using our LightWalker AT (Fotona, Slovenia) laser successfully for dental treatments and a lot of our patients complain about their snoring problems, we decided to buy an additional Er:YAG handpiece to test the newly proposed method and properly evaluate the benefits of it.

## II. MATERIALS AND METHODS

117 patients with snoring problems have visited our clinic in a period of two years. The minimally invasive NightLase treatment procedure was explained to them and all patients signed informed consent forms. The exclusion factors were photosensitive drugs, pregnancy, narrowness in the throat, scarring, obesity, too high expectations, sickness and being underage. Patients with pollen allergies were treated after the season was over.

Before the treatment, anatomic grouping was conducted using Mallampati classification and the patients were divided into four classes: Class 1 - full visibility of tonsils, uvula and soft palate; Class 2 - visibility of hard and soft palate, upper portion of tonsils and uvula; Class 3 - soft and hard palate and base of the uvula are visible; Class 4 - only hard palate visible (e.g. Fig. 1).

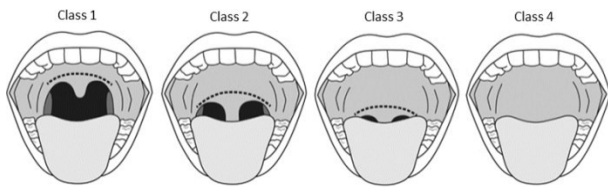


Fig. 1: Mallampati classification.

After the classification, a nonablative tightening of the anterior pillar, soft palate and uvula with the lower part of the hard palate, posterior pillars and tonsils and lateral and bottom of the tongue was performed three times in a period of 45 days. All treatments have been performed with an Er:YAG laser (LightWalker AT, Fotona, Slovenia) using the PS04 handpiece with a patterned beam in non-contact mode. The manufacturer's treatment protocol and parameters were followed [29-31].

The number of delivered treatment pulses per patient depended on the anatomy of the person, varying between 12,000 and 17,000. The procedure was stopped when shrinking in the mucosa was observed. As the treatment is non-ablative, there was no special post-operative care prescribed.

During the treatment we measured the discomfort

and pain of the patients. After the last session in a treatment period of 6 to 12 months, the patients as well as their "sleeping" partners were asked to fill in questionnaires in which they evaluated the results with a subjective assessment on a scale of 0-3 (0 = not satisfied; 1 = somehow satisfied; 2 = satisfied; 3 = very satisfied).

We also measured blood oxygen before and after the treatment to check if we could see any change in the blood oxygenation.

## III. RESULTS

Out of 117 patients who applied for treatment, 75 passed all exclusion criteria, completed all three sessions of treatment and informed us about their treatment results. Using Mallampati classification for the 75 mentioned patients, 21 were classified as Class 4, 36 as Class 3, 16 as Class 2 and two as Class 1 (Fig. 2). During the therapy the patients report no discomfort or pain and after the treatment no patient reported any adverse effect.

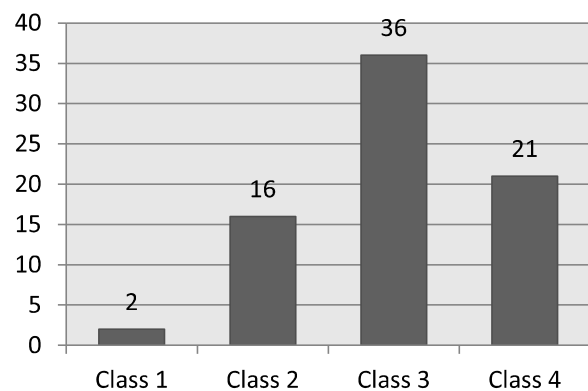


Fig. 2: Mallampati classification for 75 treated patients.

A typical **clinical** case is presented in the following photos.



Fig. 3: Patient's mouth before treatment (Class 4).



Fig. 4: Immediately after the first treatment (Class 2).



Fig. 5: After three treatments (Class 1).

The success after three treatments was 90%, with only 10% of the treated patients not satisfied with the treatment. Of all the patients, 33% (25) said that they were very satisfied, 44% (33) that they were satisfied, and 13% (10) reported being somehow satisfied with the treatment (Fig. 6).

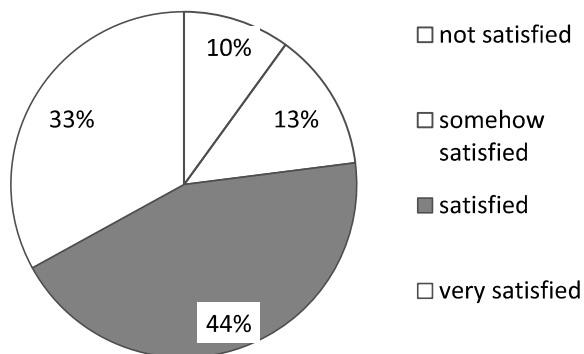


Fig 6: Patient satisfaction with the treatment (not satisfied; somehow satisfied; satisfied; very satisfied).

In addition to the high satisfaction rate, more than 80% of the patients also reported that they could breathe much easier after the treatment, being more alert and focused. They also noticed that gag reflexes were down, that they had no more pressure-related troubles when flying, fewer headaches, and they also noticed better sex and felt more confident, etc.

Concerning blood oxygenation, overall there was no significant difference in the amount of oxygen in the blood before and after the treatment. On the other hand, some of the patients had significantly better oxygen scores and none of the patients had lower oxygen scores after the treatment.

#### IV. DISCUSSION

Due to numerous limitations, high treatment risks, side effects and low treatment success rates of classical nonsurgical and surgical procedures, many people decide not to treat their snoring problems [25-28]. Since snoring can cause many health complications, it may result in a life threatening disorder and eventually in premature death [8-13].

Besides surgery, there is also a minimally invasive and more effective method available for treating snoring and apnea. The method uses laser light for thermal non-ablative heating of the treated areas, which causes shrinkage of the collagen fibers and subsequently opens up the air flow in the mouth and nose and decreases snoring and apnea problems [29-31].

In the cases presented using the NightLase treatment procedure, a 90% success rate was noticed. Comparing to more aggressive surgical and also nonsurgical methods, we achieved much better results with no side effects or risk for the patients [27]. We discovered that NightLase is easy for any doctor or dentist to perform and has an extremely high success rate in producing a positive change in sleep patterns. It requires no device to be worn during sleep, involves no chemical treatment, and no anesthesia. In our opinion NightLase represents a gentle and easy way for the patient and their loved ones to regain a good night's rest.

No matter the success rate, we also must consider that the results of the therapy may depend on the type of the snoring and apnea problem. For these reasons, examination prior to the treatment and good anamnesis is essential for a positive result. Beside this we also have to consider the exclusion criteria. In some cases, combining this therapy with other treatments is advised. For example, in cases where the

patient is overweight, a dietician can be very beneficial in helping to solve the snoring problem.

## V. CONCLUSIONS

Our clinical study confirms NightLase treatment with Er:YAG laser is a safe and efficient method for significant snoring reduction. We can now successfully address a series of health problems like snoring and OSA and prevent further complications. The method is minimally invasive with no need for special preparation or any post-operative therapy. The procedure is tolerable by all patients and doesn't require any anesthesia. It is quick and easy to perform and a sterile operational field is not required.

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