EFFECTS OF RONCHOSTIM® NASAL SOLUTION ON SNORING!

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Article: The effect of Nasal application of Ronchostim® on snoring

Observational study to assess the effect of Ronchostim® in snoring patients and their quality of sleep and life

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SUMMARY

Objectives: *To evaluate the decreased of snoring and the improvement in sleep quality, daytime tiredness and sleepiness after treatment with 1.2 mg of Ronchostim® solution instilled every night for a period of 6 months.*

Methods: *Observational study of Ronchostim® by doctors in snorer patients.*

Evaluation criteria: *Age 50-65, every night snoring according to the questionnaire, abnormal ENT- findings, acute nasal allergies, alcoholism, abusing of sleep tablets, controlled and stable cardiovascular patients. Patients had nocturnal respiratory measurements by use of inductive pletysmography and laryngeal sound measurements performed on day 1, 2, 15, 16, 29 and 30. After 6 months of treatment the participants were invited to the clinic and were asked about the treatment effect, side effects and possible other (positive) effects. Blood pressure, weight and height were measured.*

Results: *At the end of the 6 months of active treatment, the clinical data shows that 68% of the filed questionnaire coming from heavy snores, 27% from medium snores and 5% from low snores. The best effect/performance is measured at the medium and heavy snores with the effect of 86% and the lowest effect is measured at the low snores with the effect of 75%.*

Conclusion: *The nasal instillation of Ronchostim® can reduce snoring. A significant improvement in the snoring of the self or the sleeping partner was reported, as well as a significant improvement in the quality of sleep, a decrease in daytime tiredness and sleepiness when compared to the baseline values of the study.*

Keywords: Snoring, snoring sounds, frequency analysis, respiratory pattern, methods, computing, inductive plethysmography, treatment, nasal resistance, lubricating agents, polyglycols, surfactants.

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1. INTRODUCTION

Epidemiological studies have shown that snoring is widespread prevalent in the adult population. Snoring is estimated to affect 57% of men and 40% of women the worldwide population. Snoring has been found to imply social and family welfare (difficulties in maintaining work, family problems, for example because of separate bed rooms, hypersomnia, and sexual dysfunction). Snoring has been found to be a risk factor for cardiovascular and cerebrovascular disorders and complications, including high blood pressure, angina pectoris, myocardial and cerebral infarction.
Statistics studies have demonstrated that snoring is widespread, but its severity and health implications can vary. Snoring can be light and occasional, or it may be the sign of a serious underlying sleep-related breathing disorder.

Surgical treatment (Uvulo Palato Pharyngo Plastic (UPPP), Mandibular advancement etc.) are effective in some patients but are associated with operative and postoperative complications and risk for side effects. Nasal CPAP (Continuous Positive Airway Pressure) is very effective in reducing sleep apnea in patients suffering from severe sleep apnea, but most people suffering from simple snoring do not accept this treatment. Non-surgical and non-CPAP interventions, e.g. position training, tongue or dental devices have been found to be able to reduce snoring in some patients but their use has been debated and disputed. Knowing the basics about snoring — what causes it, when it's dangerous, how to treat it, and how to cope with it — can facilitate better health and eliminate a common cause of sleep complaints. Because most of the snorers does only have "simple snoring" any simple treatment of the snoring problem are of major interest.

To try to improve the quality of life of patients with snoring sleep disorder, Audistimpharma has developed the product Ronchostim® one of the most effective snore solutions in the market, as a one stop answer to all your sleep disorders. Ronchostim® is a product composed of: Polysorbate 80, Glycerol 85%, Sodium Chloride, sodium edetate, potassium sorbate and purified water.
The action of the product «reduced snoring» occurs due to the hydrating action of the product Ronchostim®. The presence of Sodium Chloride + polysorbate + glycerin [85%] in the formulation makes the mucous membranes of the throat lubricated, allowing fluidity in the passage of air and reducing snoring for a period of time between 6 and 7 hours. The lubricating action of Ronchostim® decreases nasal and pharyngeal resistance, improving airflow and passage and consequently decreases the vibration of the uvula and soft palate. The repair of muscle tone is achieved by a neural reflex mechanism (involuntary movements of muscle contraction and relaxation) because of the improvement of air passage and reduction of nasal and pharyngeal resistance. However, it is not directly related to the effect or mechanism of action of the product. Ronchostim® is effective in decreasing nasal and pharyngeal resistance due to its lubricating effect. This action is noticeable only in users with mild snoring who suffer from some type of upper airway obstruction (e.g., deviated septum, allergic and upper airways motor rhinitis and / or other events considered mild). The product has no effect on patients with sleep apnea. However, in some cases, "considering users of the light snoring group" can prove effective in preventing OSAS. Ronchostim® has a lubricating action, without any pharmacological action. The ingredients of the Ronchostim® have no pharmacological action; therefore, it has no side effects.

2. MATERIALS AND METHODS

Nature of study

Observational study to assess the effect of Ronchostim® in snoring patients, and their quality of sleep and life.

Objective

This observational study was designed to evaluate the benefits on the improvement of quality of life of patients as well as a significant improvement in the quality of sleep, a decrease in daytime tiredness and sleepiness when instilled Ronchostim® in the nostril every night at bedtime. The secondary's objectives were to evaluate the overall improvement as perceived by the patient and yours sleeping partners, good night's rest, satisfaction, adherence to the treatment and tolerance of the product.

Patient selection and adherence criteria

The population of the study was selected from a largescaled epidemiological study performed involving 3439 men, age 50-75 (5). Of those 49.9% reported every night or nearly every night snoring according to the questionnaire. From this group, 550 patients were selected by the following criteria:

1. Age 50-65,
2. Every night snoring according to the questionnaire
3. Abnormal ENT-findings, acute nasal allergies, alcoholism, abuse of sleeping tablets, major cardiovascular, cerebrovascular and psychiatric diseases were exclusion criteria. Controlled and stable cardiovascular diseases were accepted. Former cerebrovascular disorders were excluded.

All the 550 people were invited by postal invitation. From this large group, 278 people agreed to participate in the study and met the inclusion criteria. This population was divided into 224 people for the acceptance study and 54 people for the controlled study.

The group was invited to the hospital to answer a standardized questionnaire and underwent a general physical examination and ENT physical examination. Blood pressure was measured in the left arm after at least 10 minutes of rest in the sitting position. Weight and height were determined and the body mass index (BMI) was calculated using the Quetelets index.

Evaluation Criteria

The criteria for evaluating efficacy were:

- Quality of life evaluated by the sleeping partner [score 6]
- Quality of life evaluated by the patient [score 5.8]
- Quality of sleep evaluated by the partner [score 6]
- Decrease of tiredness perception [score 8.3]
- Decrease of sleepiness perception [score 9]
- Satisfaction with the treatment [score 6.9]

Survey process and data collection

The following measurements were performed:

1. Nocturnal respiratory measurements by use of inductive plethysmography.
2. Laryngeal sound measurements.
3. A questionnaire in both treatment periods.

The nocturnal measurement was performed on day 1, 2, 15, 16, 29 and 30. The treatment periods were in periods "A" day 2 to day 15, and in periods "B" day 16 to day 29. Day 1 and day 30 were without any treatment in order to reduce the influence of the first night effect and to characterize the period effect.

The laryngeal sound was determined by use of a laryngeal microphone (Senheiser). The sound was amplified and subdivided in the following frequency responses: 0.25-0.75 KHz (mean: 0.5 KHz), 0.75-1, 5 (mean: 1.0 KHz) and 1,5-3.0 (mean: 2.0 KHz). The frequency responses were separated by analog filters. The signals were smoothed with an integration time of 35 milliseconds. The selection of the frequency responses were performed based on a former study of the frequency responses during snoring (13), showing that the main part of the frequencies is within the range of 250-3000 Hz (figure 1). A lower frequency component exists, however, in this frequency major noise from movements and artifact arose, why frequencies below 250 Hz were not included.

Laryngeal sound and inductive plethysmography were sampled on a portable microcomputer (Olivetti) using a 12 bit analogdigital converter (Data Translation). The sampling rate was 10 Hz (S –1) on all channels.

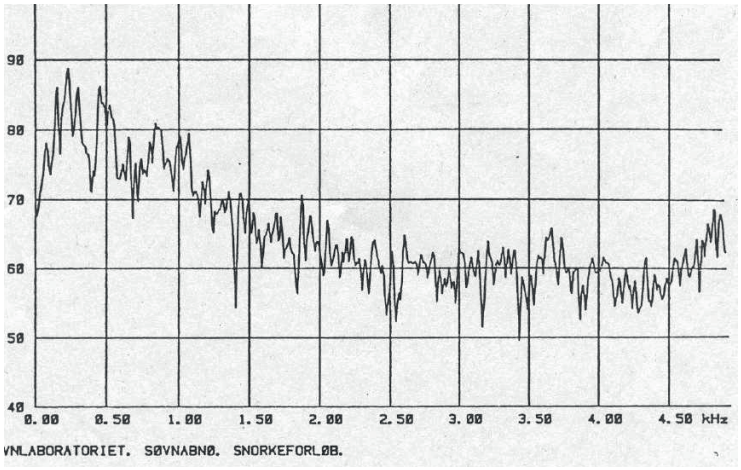


Fig.1 - **Normal respiration.**

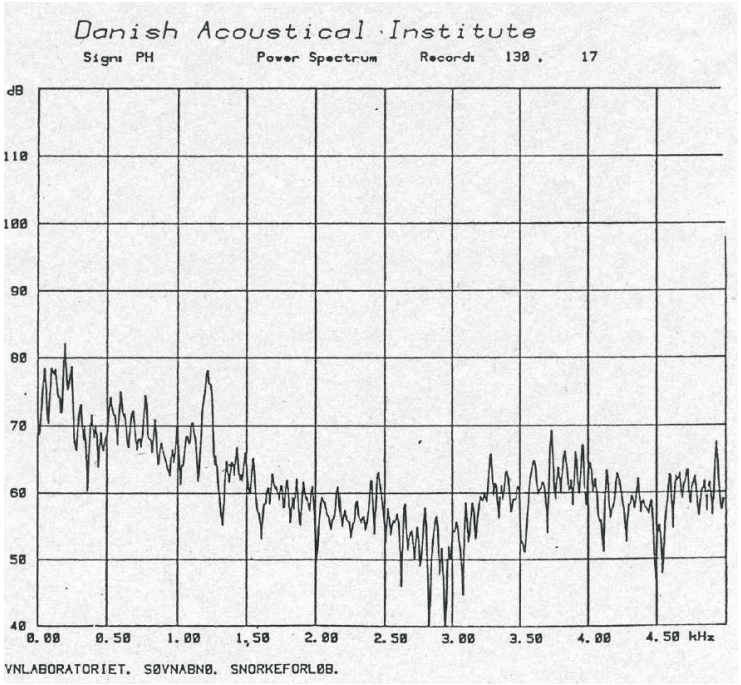


Fig.2 - **Respiration and laryngeal sounds during a snoring episode.**

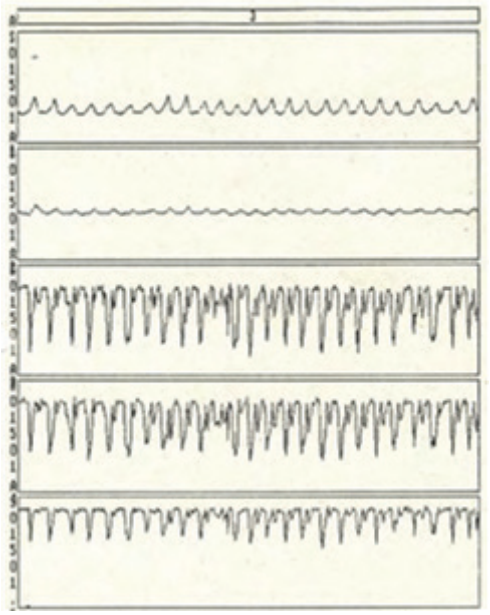


Fig.3 - **Respiratory movements and laryngeal sounds.**

The microphones and amplifiers were calibrated every month using a Brüel and Kjær (B&K 4230, Copenhagen, Denmark) equipment. Data range within a distortion less than 1% was 24-98 dB for the microphone, amplifiers and the analogdigital converter. It was ensured that the same participants always used the same equipment.

Before start of the study measurements with a microphone 50 cm from the persons head were compared with a laryngeal position in three measurements in different rooms. It was found, that in traditional bed rooms and in traditional hospital rooms major noise arose and disturbed the measurements, thereby decreasing the reliability of the measurements of the respiratory sound measurements. Based on these data it was decided to use a laryngeal position of the microphone instead of a room microphone. All nocturnal recordings were performed in ambulatory with portable equipment. All participants were visited by the same technician, who set up the equipment in the bed room and gave further instructions about the study and the equipment. The measurements started automatically. At the termination of the recordings the participants just had to stop the sampling by pressing on the computer board in the morning. Then the following measurements were written to the file: time of start and stop of the sampling and the recording-date. The equipment was collected after the recording nights. All data were analyses for invalid and missing data. If any data were insufficient they were recollected if possible or the patients were excluded. In two patients the data were insufficient (2 out of 54) and these patients were excluded. One patient had a myocardial infarction and 1 patient denied to participate before entry to the study. In total 50 participants finalized the study.
According to a double blind randomization design the technician brought the medications to the participants and collected them after each period.

Respiratory Distress Index (RDI) was determined by the total apnea and hypopnea determinations which were based upon visual analysis.
The following measurements were determined: apnea, hypopnea, RDI, the mean respiratory time index (RTI) the mean and maximum values of the sound measurements of the laryngeal microphone subdivided in the three octaves recorded.
Because the nasal clearance is few hours (< 1 – 2 hours), the data has been further recalculated for respiratory sounds and apnea within the period 30 – 90 minutes of sleep, in order to characterize the effects of respiratory abnormalities and changes within this first period of sleep.

Pharmacovigilance

Ronchostim® has a lubricating action, without any pharmacological action. The ingredients of the Ronchostim® have no pharmacological action; therefore, it has no side effects. Snoring is not a disease, but a sleep disorder that can cause various diseases. The product Ronchostim® is intended to act in the prevention of snoring and consequently in the prevention of diseases that this disorder can cause. Ronchostim® has no healing power; the interruption of the use of this airway lubricant will bring snoring back to the snorer. The use of the product does not eliminate the recommendations given by doctors to reduce snoring such as: weight loss, quitting smoking, avoiding alcoholic beverages and physical exercise.

The study product Ronchostim®

Ronchostim® is a product composed of: Polysorbate 80, Glycerol 85%, Sodium Chloride, Edetadosódico, potassium sorbate and purified water. The action of the product «reduced snoring» occurs due to the hydrating action of the product Ronchostim®. The presence of Sodium Chloride + polysorbate + glycerin [85%] in the formulation makes the mucous membranes of the throat lubricated, allowing fluidity in the passage of air and reducing snoring for a period of time between 6 and 7 hours. The lubricating action of Ronchostim® decreases nasal and pharyngeal resistance, improving airflow and passage and consequently decreases the vibration of the uvula and soft palate.

3. STATISTICAL ANALYSIS PLAN

Surveyed Population

The statistical analysis plan was performed for the enrolled patients whose records could be evaluated at the end of the data review. The surveyed population attended to the inclusion criteria "snoring reported every night or nearly every night". This population was divided in 224 persons to the acceptance study and 54 persons to the controlled study. All participants used the Ronchostim®, and underwent evaluation at the sixth month for the follow-up visit.

Efficacy Study

After 6 months of treatment the participants were invited to the clinic and were asked about the treatment effectiveness, side effects and possible others (positive) effects. The questionnaire was answered by the sleeping partners and endusers of Ronchostim® and based on it, a correlation analysis was performed to check the improvement in quality of life, quality of sleep, tiredness and sleepness.

Justification of the number of patients

The sample size was calculated based on a largescale epidemiological study conducted in the Copenhagen area involving 3,439 men, aged 50 to 75 years. In this study, 49.9% of the participants reported snoring every night or almost every night. Of this group, 550 potential participants met the inclusion criteria and were invited to participate in the study. Of the 550 invitations, 278 accepted, the study group was splited into 224 participants for the acceptance study and 54 participants for the controlled study side effects

Statistical level of significance

The average and Standard Deviation (SD) or average range were calculated on all data. Data were compared using non-parametric statistics (Mann Whitney).The level of statistic significance was set at $p<0.05$.

4. RESULTS

Study Outcome

After 6 months of treatment, 66.1% of the patients continued to use the Ronchostim® solution. A significant reduction in snoring was reported by the participants and sleeping partner and a significant improvement was reported in sleep quality and daytime symptoms over the treatment period compared to baseline.

Clinical Characteristics of Patients

The 278 patients in the study were men aged 50 to 75 years, with a prevalence of nocturnal snoring, reported by themselves or their sleeping partner, and consequently had daytime symptoms (drowsiness and tiredness).

Patients characteristics at enrolment	
Age	50 – 75 years
Sex	Male
Intermittent daytime sleepiness	72,8%
Imperative sleepiness	9,9%
Every night snoring	52,6%
Sleeping partners complaints	85,1%

In total, 88.4% of patients used Ronchostim® solution 5 nights per week after 6 months of active treatment. In 40.4% of this group, improvement in sleep quality and reduction in snoring were reported, and in 7.9% of this population, snoring disappeared completely. The treatment was adjusted to 7 nights per week and after this adjustment, there was a perceived improvement in the quality of patient sleep night to 78 %.

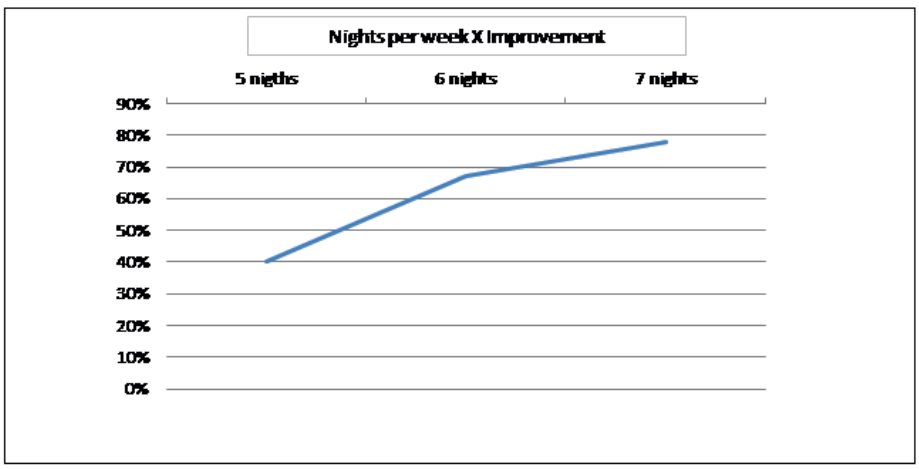
The respiratory parameters calculated as RDI and ATI were improved within the test period compared to control, but this effect showed no statistical significance. No difference were observed between RDI and RTI if RDI.

Impact of Snoring

Sleep-disordered breathing (SDB) represents a spectrum of sleep-related disorders associated with significant medical comorbidities. Snoring can negatively impact the quality of sleep and consequently the quality of life. Snoring affects brain activity during sleep, affecting the ability to process emotional experiences, directly impacting mental health. Poor sleep quality, lack of sleep, and sleep disruption caused by snoring can influence the mood and emotional well-being of the individual in the long term.

Efficacy Criteria with Ronchostim®

Clinically proven Ronchostim® nasal delivery system effectively removes the cause of snoring. Approximately 2/3 (66.1%) of snoring studied population continuously used a solution containing Ronchostim®. Approximately 2/3 of this population (in total 50% of all snorers and 67% of daily users with 6.03 days/weeks) reported reduced snoring. When adjusted for 7 days/week the improvement related to the quality of sleep was 78%.



Tolerance of the product

Side effects are minimal and no serious side effects have been observed.

5. DISCUSSION

Epidemiological studies have shown that snoring is very prevalent in the adult population. Snoring is more common among men and increases with age, mainly after the sixty years. Snoring has been found to imply social and family welfare (difficulties in maintaining work, family problems, for example because of separate bed rooms, hypersomnia, and sexual dysfunction). Snoring has been found to be a risk factor for cardiovascular and cerebrovascular disorders and complications, including high blood pressure, angina pectoris, myocardial and cerebral infarction.

Surgical treatment (Uvulo Palato PharyngoPlastic (UPPP), Mandibular advancement etc.) are effective in some patients but are associated with operative and postoperative complications and risk for side effects. Nasal CPAP (Continuous Positive Airway Pressure) is very effective in reducing sleep apnea in patients suffering from severe sleep apnea, but most people suffering from simple snoring do not accept this treatment. Non-surgical and non-CPAP interventions, e.g. position training, tongue or dental devices have been found to be able to reduce snoring in some patients but their use has been debated and disputed. Because most of the snorers does only have "simple snoring" any simple treatment of the snoring problem are of major interest.

Many snorers are known to be tired during the day. Little is known; however, about the effect snoring has on a snorer's quality of life, not to mention that of the sleeping partner. In this study, we found significantly impaired quality of life when we compared the results with those of a population sample. This was most pronounced when it came to the assessment of energy, which might explain why snorers suffer from daytime tiredness.
After 6 months of treatment, the snoring group reduced its mean score significantly and experienced a better quality of life.

The product Ronchostim® has used during the past 3 decades as an alternative treatment for snoring improving the quality of life of many enduser and its sleeping partners. Little information is available on the sleep quality and morning well-being of snorers' sleep partners. Sometimes, the sleeping partner asks their partner (the snorer) to visit a physician, who examines the snorer but usually pays no attention to the sleeping partner problems during the night. Any assessment of snoring by self-report has to be limited because snorers may be unaware of their snoring; it is, therefore, recommended that spouses be routinely asked about their own sleep difficulties.

The present study underlines the importance of the effect of snoring on the quality of life of a snorer and the sense of well-being in the morning of his female sleeping partner. Snoring obviously interferes with daily life, and it may be a problem for the whole family. The study also showed that, when air flow during the breathing is improved in snorer individual, snoring decreases, and both the snorer and its sleeping partner may benefit the following day from this.

6. CONCLUSION

Clinical data show that the best effect/performance is measured in medium and heavy snorers. The mechanism of effect of nasal application of Ronchostim® liquids instilled in the nose increases the tone of the upper airways, decreasing nasal and pharyngeal resistance. The use of Ronchostim® associated with healthy diet and living habits can lead the patient to have a better quality of sleep and, consequently, a better quality of life.

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