



BRIEF COMMUNICATION

Hypoglossal Nerve Stimulation Surgery for Obstructive Sleep Apnoea: Our Preliminary Experience[☆]



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KEYWORDS

Nerve stimulation;
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Neurostimulation;
Sleep medicine

Abstract The objective of this communication is to describe our preliminary results in upper airway stimulation surgery via hypoglossal nerve stimulation implantation for obstructive sleep apnoea. We describe 4 cases and the outcomes of the surgery were analysed using the Epworth scale, apnoea-hypopnoea index, minimal O₂ Sat, average O₂ Sat and snoring intensity. In all cases a significant reduction in Epworth scale values and apnoea-hypopnoea index were obtained ($P<.05$). The minimum and average oxygen saturation had better values after the surgery, however, there was no statistically significant difference. The snoring severity measured subjectively changed from "intense" to "absent" in all cases. The preliminary results obtained with the upper airway stimulation surgery via hypoglossal nerve stimulation showed objective and subjective improvement after the implant activation.

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PALABRAS CLAVE

Estimulación nerviosa;
Apnea obstructiva del sueño;
Nervio hipogloso;
Neuroestimulación;
Medicina del sueño

Cirugía de implante de estimulador de nervio hipogloso en el síndrome de apnea obstructiva del sueño: nuestra experiencia preliminar

Resumen El objetivo de esta comunicación es presentar nuestros resultados preliminares en la cirugía de estimulación de la vía aérea mediante el implante de estimulador de nervio hipogloso para el síndrome de apnea obstructiva del sueño. Presentamos 4 casos en los que se valoraron los resultados de la cirugía empleando la escala de Epworth, el índice de apneas-hipopneas,

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SatO₂ mínima, SatO₂ promedio y la intensidad del ronquido. En los 4 casos se evidenció una disminución significativa de los valores de la escala de Epworth y el índice de apneas-hipopneas ($p < 0,05$). La saturación de oxígeno mínima y promedio tuvo mejores valores en el posquirúrgico; sin embargo, la diferencia no fue estadísticamente significativa. La severidad de los ronquidos medida de forma subjetiva pasó de «intensa» en todos los casos a «ausente». Los resultados preliminares obtenidos ponen en evidencia una mejora tanto objetiva como subjetiva tras la activación del implante.

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Introduction

The right treatment for obstructive sleep apnoea and hypopnoea syndrome (OSAHS) has been proven to improve quality of life, reduce associated morbidities and healthcare costs.¹ Treatment for OSAHS is based on 2 non exclusive pillars: non surgical treatment (positive expiratory pressure and mandibular advance devices)² and surgical treatment, which up until recent years was solely based on modification of the anatomy, the main drawbacks of which were postoperative pain and a variable success rate (between 20% and 60%).³

Functional surgery of the upper airways is a new technique and aims to increase the calibre of this area without changing the anatomy by the insertion of a neurostimulator which acts selectively on the fibres of the hypoglossal nerve responsible for lingual protrusion. These impulses are synchronised with ventilation, detected using an intercostal sensor. This technique was first described in 2001 by Schwartz⁴ and has been approved by the Food and Drug Administration³ since 2014.

Material and Methods

Patients

Four patients with moderate to severe OSAHS and no tolerance to CPAP were selected (Table 1). A detailed medical record was made and a physical examination performed, in addition to a fibro-endoscopic study in the doctor's surgery, a baseline polysomnography, an Epworth questionnaire and an endoscopic study of induced sleep.

Inclusion Criteria

- Over 18 years of age.
- Body mass index (BMI) $< 32 \text{ kg/m}^2$.
- Anteroposterior oropharyngeal collapse.
- Friedman I-II lingual tonsil.
- Friedman I-II grade palatine tonsils.
- Apnoea hypopnea index (AHI) > 15 events/hour and < 55 events/hour.
- Under 20% central apnoeas.

Exclusion Criteria

- Concentric or lateral oropharyngeal collapse.
- Cranial nerve XII paralysis, pulmonary or neuromuscular disease, uncontrolled high blood pressure, active psychiatric disorder, severe cardiac dysfunction, swallowing disorders and coexisting non respiratory sleep disorder.

Parameters of the Study

- Epworth scale.
- AHI.
- Maximum and minimum oxygen saturation.
- Snoring intensity (subjective, according to bed partner).

Surgical and Activation Technique

Surgery^{3,5,6} is performed under general anaesthesia, with all patients admitted to hospital the same day as the operation and discharged the day after the operation. A total of 3 incisions (Fig. 1) were made. The medial fibres (protruding) of the hypoglossal nerves were determined under microscopic vision, with prior insertion of lingual electrodes (Fig. 2) and with the help of a neurophysiologist who was present during surgery.

The pulse generator was positioned in a virtual space under the subcutaneous tissue and superficial to the pectoralis major muscle and the sensor, between the external or internal intercostal muscle. Once the 3 parts of the system had been positioned, the wires were connected by tunnelling through the subcutaneous tissue. Prior to fixing the generator with permanent suture points to the fascia of the pectoralis major muscle and closing the incisions, the correct functioning of the pulse generator was confirmed, with movement of tongue protrusion being appreciated when the nerve fibres were stimulated. The 2 chest incisions were covered over with an elastic compression pad. The day after surgery a plain scan was taken with posteroanterior and lateral projections to ensure the correct positioning of the different parts of the system (Fig. 3).

Activation of the implant was made one month later in the department of neurophysiology, using telemetry and 2

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