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# Hypnosis in High-Intensity Focused Ultrasound for Thyroid Nodule Ablation

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Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
Literature Search F  
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**Patient:** Female, 70-year-old  
**Final Diagnosis:** Thyroid nodule  
**Symptoms:** None  
**Clinical Procedure:** Hypnosis • mild sedation • non-operating room anesthesia (NORA)  
**Specialty:** Anesthesiology • Endocrinology and Metaboli

**Objective:** Unusual setting of medical care

**Background:** Current medical technologies enable physicians to treat patients outside operating rooms using minimally invasive techniques. Non-operating room anesthesia (NORA) represents a growing field of medicine, with an increasing number of cases performed over the last decade. As a result, anesthesia providers will need to enhance their understanding of the resources, medical and paramedical staff, and environment outside the operating room. Patients undergoing such procedures under light conscious sedation still experience discomfort such as pain and anxiety, thus requiring the use of pain control medication or sedative drugs. At the same time, the use of hypnosis is spreading in medical practice, particularly with minimally invasive procedures. Many studies have investigated the use of hypnosis in cases of minimally invasive procedures, showing an effective reduction of patients' discomfort and consumption of pain control medication, thus improving patient safety.

**Case Report:** We describe the case of a woman in her 70s who underwent a thyroid nodule thermal ablation through high-intensity focused ultrasound (HIFU) performed under hypnosis in a NORA setting. The procedure was well endured; the patient experienced comfort and was satisfied with having avoided general anesthesia. Post-HIFU follow-up showed a 30% decrease of thyroid nodule volume. The patient was completely satisfied with the esthetic result. The operator did not encounter any difficulties with the awoken patient or movements during the procedure.

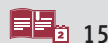
**Conclusions:** Our case confirms the effective role of hypnosis in relaxation and coping with painful procedures and highlights patient satisfaction without the use of sedative drugs in the context of NORA procedures.

**Keywords:** Extracorporeal Shockwave Therapy • Hypnosis • Anesthesia

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## Background

Thyroid nodules are very common and are usually asymptomatic. With an increasing number of imaging studies currently performed, many thyroid nodules are discovered incidentally. Most of them are benign, but some can grow and become symptomatic. Surgical resection is traditionally recommended but is associated with complications such as bleeding, infection, recurrent laryngeal nerve damage, or hypothyroidism [1].

High-intensity focused ultrasound (HIFU) therapy is known as one of the relatively safe, minimally invasive thermal ablation techniques to treat benign thyroid nodules [2]. HIFU directs an ultrasound energy beam inside the targeted nodule, without needles or any invasive instruments. The tissue is then heated up to 80°C to 90°C, which irreversibly causes necrosis coagulation [3]. This leads to tissue edema and swelling, causing mild pain. Therefore, different anesthesia approaches are suitable, including monitored anesthesia care and regional or general anesthesia [4,5].

Hypnosis is a technique that is increasing widely in medical practice, offering a valid alternative for anesthesiologists in some low-risk procedures. It contributes to patient relaxation and provides sedation and analgesia [6,7].

We describe an application of hypnosis techniques for a thyroid nodule ablation performed by HIFU.

## Case Report

Our female patient was a former healthcare provider in her seventies, presenting a multinodular goiter with 2 benign left nodules. Although she was asymptomatic (no thyrotoxic syndrome, no pain, no pressure), she found the lower one (18 mL) esthetically disturbing as it progressively grew over the years. Therefore, thermal ablation by HIFU was planned.

### Hypnosis

As a retired healthcare provider, the patient was familiar with medical hypnosis since she had witnessed hypnotherapy sessions being performed by practitioners on her patients. We organized a hypnosis session 3 weeks before the HIFU procedure to allow the patient to get acquainted with the practitioner, share her interests, and be guided to find a safe psychological place. She was fond of painting and hiking. The session began with breathing induction, which put the patient into a trance. She recalled a trip to Arizona, to Antelope Canyon, which had impressed her very much. She was dazzled by the colors and was accompanied by a musician who played the flute. At the end of the session, the hypnotherapist set up an ideomotor

signaling code with the patient, saying that lifting a finger meant “yes”, so that she could notify of any pain or annoyance.

On the day of the procedure, premedication with paracetamol and a non-steroidal anti-inflammatory drug was administered per os 1 h before the procedure. The hypnosis was performed by the same practitioner who guided the patient during the previous session. Intranasal fentanyl was available to be titrated throughout the session if needed. Progressive muscle relaxation was used as hypnosis induction. The practitioner's voice led the patient on a journey to a wholly comfortable place, where a warm breeze blew on her neck, tickling her skin and gradually fading. The painful HIFU wave bursts were included in the scenario with different images: the presence of birds, butterflies landing on her neck, and the visualization of balls of energy of various colors bursting, allowing her to finally enjoy a bubbly Prosecco with each bubbly burst of pain, giving her strength and vitality. While guiding the patient, the hypnotherapist kept observing the patient's movements, and when she lifted her finger, fentanyl was administered. Altogether, she received 150 mcg of fentanyl intranasally. The whole procedure lasted 90 min.

### Anesthesia

The procedure was executed with the assistance of an anesthesiologist trained in hypnosis in a NORA setting. NORA represents a growing field of medicine with new challenges for anesthesiologists, since anesthesia performed outside of the operating room must be held to the same high standards of care as in the operating room [8]. Anesthesiologists have to take care of patients who may not be eligible for standard surgery, in a setting that is outsourced and where they usually work alone. In these conditions, experience, fast onset and elimination of drugs, minimal hemodynamics, and respiratory impact are essential for patient safety [9].

In our case, to ensure the patient's safety, basic monitoring was provided, including oxygenation, ventilation, circulation, and temperature. These were continually evaluated following the standards for basic anesthetic monitoring developed by the committee of American Society of Anesthesiologists [10].

Oxygenation was assessed continuously with a pulse oximetry with a threshold alarm at 94%, which means that if the blood oxygenation was under 94%, the alarm would alert the anesthesiologist. The room was equipped with an oxygen pipeline, and oxygen could be provided if needed, either via facial mask or nasal cannula. Also, to ensure adequate ventilation, the presence of exhaled carbon dioxide was monitored by nasal cannula capnography. At the same time, while talking to the patient, the anesthesiologist continuously focused on clinical signs, such as breathing movements and skin color.

To assess the patient's circulation, an electrocardiogram was displayed from the beginning of hypnosis and was continuously monitored, as was blood pressure.

An emergency cart, which included a ready-to-use emergency intubation set and a portable anesthesia machine, was available to the anesthesiologist in the event of need. The anesthesiologist also had the possibility of calling colleagues, should an emergency have arisen.

## Results

The procedure was successful, and both the patient and the endocrinologist were satisfied. The patient was pleased after the HIFU session under hypnosis, which helped her stay relaxed. She was glad to have avoided general anesthesia. She was able to go back home on the same day and did not report any post-procedure pain.

Ultrasound performed 3 months later showed a 30% decrease in the nodule volume, and the patient was satisfied with the esthetic result.

## Discussion

HIFU is most commonly used as a part of treatment for hepatocellular carcinoma, prostate hyperplasia, and uterine fibroids [5]. Although minimally invasive, HIFU ablation is not a painless procedure. For this reason, it is usually performed under a combination of analgesia and sedation, as described in many studies. In the pilot study of Vaessen et al, patients underwent magnetic resonance-HIFU treatments for uterine fibroids under sedation with propofol and S-ketamine [4]. In their study, van Breugel et al investigated and confirmed the feasibility of liver HIFU thermal ablation under sedation with remifentanyl and propofol [11]. Fu et al compared the efficacy of 2 regimens of sedation and analgesia during HIFU for patients with uterine fibroids – dexmedetomidine-remifentanyl vs midazolam-remifentanyl – and concluded that both met the requirements and ensured the safety of the HIFU procedure [12]. In all these studies, investigators performed HIFU using a combination of a sedative and an analgesic drug.

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In our case, the patient did not need any sedative drugs and received analgesia only intranasally with 150 mcg of fentanyl. During the HIFU session, the hypnosis healthcare provider remained in constant contact with the patient, helping her to create a relaxing atmosphere through hypnosis. The patient managed to stay calm and relaxed without losing consciousness. Thyroid nodule thermal ablation requires less energy than does uterine fibroid ablation, as thyroid nodules are smaller than uterine fibroids. In the present case, the changed state of awareness induced by hypnosis and the creation of a comfortable atmosphere allowed for the procedure to be performed safely without the use of sedative drugs.

Hypnosis is defined as an altered state of consciousness characterized by increased suggestibility, with a capacity to alter perception and memory and to directly control certain physiological functions that are normally involuntary [13]. It is a non-pharmacological technique that, at the same time, provides relaxation, anxiolysis, sedation, and analgesia. It is either used alone or as an adjunct treatment to reduce pain and surgical distress [14].

Hypnosis is often used as an alternative to general anesthesia in different situations, such as minimally invasive procedures, treatment of vulnerable patients with chronic illnesses, or high-risk procedures, which include potential difficult challenges for anesthesiologists. Thyroid procedures are known to present “never-ending challenges” for anesthesiologists, and one of the greatest difficulties is airway management due to enlarged goiters [15]. Opting for hypnosis as a supplement to a minimally invasive procedure enables thyroid nodule thermal ablation by HIFU to be performed without exposing the patient to unnecessary anesthesia-related risks.

## Conclusions

This is, so far, the first case report of HIFU thyroid nodule resection performed under hypnosis. Our case confirms the role of hypnosis in relaxation and in coping with painful procedures. It also shows patient satisfaction without the use of sedative drugs in the context of NORA procedures in which anesthesiologists have received training in hypnosis techniques.

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