



# Hypnosis associated with 3D immersive virtual reality technology during bronchoscopy under local anesthesia

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**Background:** Patients undergoing flexible bronchoscopy under local anesthesia usually experience anxiety before and during the procedure. Different non-pharmacological techniques, including music and hypnosis, are used to distract patients' attention, and to reduce anxiety. The new technique "virtual reality hypnosis (VRH)", defined as a hypnotic induction suggestion delivered by personalized virtual reality software, can generate a simulation of a lifelike environment. No study has described the use of VRH during bronchoscopy. The objective is to investigate the anxiety reducing effect and the satisfaction of patients, physicians, and nurses using VRH during bronchoscopy.

**Methods:** VRH was proposed to all patients who experienced anxiety before undergoing flexible bronchoscopy under local anesthesia. Local anesthesia was performed using 5% lidocaine spray only. No sedation was used. After the procedure, patients, physicians and nurses filled a standardized satisfaction form.

**Results:** Twenty consecutive patients who reported pre-procedure anxiety were included. The sex ratio was 16 women/4 men, the median age was 65 years. Eight patients (40%) had undergone a previous bronchoscopy under local anesthesia. The median duration of the procedure was 10 minutes, and all procedures were completed. The median level of anxiety of patients decreased from 9/10 before the procedure to 4/10 during the procedure. The median satisfaction rate regarding the use of VRH was 10/10. All patients agreed to use VRH again in case of a new bronchoscopy procedure.

**Conclusions:** This preliminary report has shown that VRH was useful to reduce patients' anxiety during bronchoscopy under local anesthesia. VRH was easily implemented in the routine practice.

**Keywords:** Bronchoscopy; lung cancer; radial endobronchial ultrasound; virtual reality hypnosis (VRH)

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## Introduction

Bronchoscopy is an invasive tool for the diagnosis of lung disease (cancer, infection or interstitial pneumonia). Anxiety and discomfort related to bronchoscopy are usual in patients and could jeopardize the success of the

procedure (1-3). If sedative drugs can be used in some countries without restriction (4), they are not allowed in France unless an anesthesiologist is present during the bronchoscopy procedure (5). Moreover, sedative drugs could increase the risk of respiratory depression (4,6). Non-pharmacological techniques are currently being used as



**Figure 1** Fiber-bronchoscopy under local anesthesia with VRH (this image is published with the patient's consent). VRH, virtual reality hypnosis.

complementary tools such as hypnosis. Hypnosis is defined as a “state of consciousness involving focused attention and reduced peripheral awareness, characterized by an enhanced capacity for response to suggestions.” (7). Hypnosis can be used in various medical procedures (8) and is associated with improved comfort and better conditions for patients, physicians and nurses during procedures. Virtual reality hypnosis (VRH) is a newly available technique, defined as hypnotic induction and analgesic suggestion, delivered by personalized virtual reality software. The use of VRH to facilitate induction and analgesic suggestion has been evaluated in very few studies (9). To our knowledge no study has described the use of VRH during bronchoscopy. The aim of this study was to investigate the anxiety reducing effect and the satisfaction of patients, physicians, and nurses using VRH during bronchoscopy. We present the following article in accordance with the TREND reporting checklist (available at <https://jtd.amegroups.com/article/view/10.21037/jtd-22-461/rc>).

## Methods

Between September and December 2021, VRH was proposed to all consecutive patients who experienced anxiety before undergoing flexible bronchoscopy under local anesthesia. Local anesthesia was performed using 5% lidocaine spray only. No sedation was used. The bronchoscope was either a 5 mm scope (Olympus BFP180) or a 4 mm (Olympus BFP190).

VRH was performed using a PICO G2 4K (PICO, San Francisco, CA, USA) which presents as LCD goggles

(LCD 4K 3,840×2,160 pixels). The device weighs 298 g. The content used was created by HypnoVR (HypnoVR®, Strasbourg, France) (Figure 1). It displays a slow-motion movie from different scenarios (mountain, forest, tropical beach, space or deep-sea diving) (Figure 2). It also incorporates headphones that transmit the narrative hypnosis, which follows a classic medical hypnosis session (induction, suggestion and return), and integrates sequences of controlled breathing, cardiac coherence and hypnotic suggestions. The hypnosis narration has been developed by specialists in hypnosis. The duration of VRH was adapted to the expected duration of the procedure (10 or 20 minutes).

Just after the procedure, before the patient leaves the bronchoscopy suite, physicians and nurses filled a standardized satisfaction form with items related to patient characteristics, duration of the bronchoscopy procedure, type and duration of the scenario chosen, and satisfaction with VRH (on a scale of 0 to 10). In the same time, before leaving the bronchoscopy suite, patients also filled the satisfaction form and in addition reported their anxiety level before the procedure and during the procedure using a numeric scale from 0 to 10. This non-interventional study protocol was approved by the Institutional Review Board of Rouen University Hospital (protocol agreement E2020-84). All research was performed in accordance with relevant guidelines and regulations, namely the European Directive 2014/536/EU, the French law 2012-300 regulating biomedical research. This study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). According to Rouen University Hospital Regulation, patients were asked and agreed for the use of their medical record data for medical research and publication.

## Results

Twenty consecutive patients who experienced anxiety before undergoing bronchoscopy under local anesthesia accepted the use of VRH and were included in this study (Table 1). The sex ratio was 16 women/4 men, the median age was 65 years (min – max: 23–77). Among them, 8 patients (40%) had undergone a previous bronchoscopy procedure under local anesthesia. The median duration of the procedure was 10 minutes, and all procedures were completed. In 10 cases the bronchoscopy was performed for a peripheral lung nodule diagnosis with radial endobronchial ultrasound (r-EBUS), in 5 cases for a proximal lesion diagnosis and in 5 cases for interstitial lung disease with bronchoalveolar lavage (BAL). The median level of anxiety of patients



**Figure 2** Virtual reality mask, with different types of scenario.

decreased from 9/10 before the procedure to 4/10 during the procedure. The median satisfaction rate of patients, physicians and nurses regarding the use of VRH was 10/10. All patients agreed to use VRH again in case of a new bronchoscopy procedure. No patients experienced adverse events related to the VRH mask.

## Discussion

In this preliminary study, we investigated the use of VRH to reduce patients' anxiety during bronchoscopy under local anesthesia and report a high level of satisfaction with VRH of patients, physicians and nurses.

Hypnosis includes three main components: absorption, dissociation and suggestibility. Absorption represents the patient's full involvement in a perceptual, imaginative or ideational experience; dissociation represents the patient's mental separation from the environment; and suggestibility represents the patient's responsiveness to social cues, resulting in an augmented tendency for compliance with instructions and a relative suspension of critical evaluation. Hypnosis allows patients to be focused on their inner world, by including cognitive and behavioral components that help to influence body sensations and perceptions (10).

Several studies have reported methods which are not strictly speaking hypnosis but could help to distract patients' attention from the bronchoscopy procedure: one study reported that distraction therapy with sights and sounds of nature before, during, and after bronchoscopy did not

reduce anxiety in patients undergoing the procedure, while it significantly reduced pain in the same population (11). Another study investigated the effect of verbal empathy and touch before bronchoscopy to reduce anxiety in patients with a high level of anxiety at baseline (12). In a meta-analysis, Tam *et al.* (13) assessed the use of music during the procedure to reduce blood pressure and heart rate among patients undergoing bronchoscopy, and authors suggested a lower level of anxiety, but meta-analysis for anxiety could not be conducted because of the different measurement tools used in the different studies. Another study also assessed the use of music to reduce anxiety in patients undergoing bronchoscopy, provided that the music complies with the patient's preferences (14).

Hypnosis has been used in other medical specialties, especially in urology or digestive endoscopy, and studies suggest a benefit to reduce anxiety and increase patient satisfaction (15,16). Moreover, a meta-analysis published in 2014, showed that suggestive techniques might be useful tools to alleviate postoperative anxiety and pain in surgery (17).

Only one study has reported the use of hypnosis during bronchoscopy (18). This randomized study of 60 patients compared a hypnosis group and a standard group. Patients filled a standardized form to assess levels of anxiety, cough, dyspnea and pain before and after the procedure, with a numeric scale from 0 to 10. In the hypnosis group, levels of anxiety, cough, and dyspnea decreased, whereas they all increased in the standard group, which more often required the addition of local anesthesia. In the standard group,

Table 1 Results

Patient	Patient characteristics				Duration of bronchoscopy procedure (min)	Patient evaluation				Team evaluation
	Age (years)	Sex	Previous bronchoscopy before current procedure	Type of scenario of VRH		Anxiety before bronchoscopy procedure (0–10)	Anxiety during bronchoscopy procedure (0–10)	Satisfaction with VRH (0–10)	Agreement to use VRH again	Physician and nurse satisfaction with VRH (0–10)
1	49	F	Yes	Tropical beach	15	7	4	10	Yes	10
2	74	F	Yes	Mountain	10	8	4	9	Yes	9
3	48	F	No	Tropical beach	15	10	3	8	Yes	8
4	23	F	Yes	Forest	10	10	5	8	Yes	8
5	58	F	Yes	Tropical beach	15	10	5	8	Yes	8
6	76	F	No	Tropical beach	10	10	2	10	Yes	10
7	77	M	No	Forest	10	10	4	8	Yes	8
8	65	F	Yes	Tropical beach	10	8	0	10	Yes	10
9	77	F	Yes	Forest	15	8	4	6	Yes	6
10	70	F	No	Forest	10	8	4	8	Yes	8
11	68	F	No	Tropical beach	10	10	4	8	Yes	9
12	51	F	No	Tropical beach	10	9	4	10	Yes	10
13	58	F	No	Tropical beach	10	10	4	10	Yes	10
14	64	F	No	Tropical beach	10	8	4	10	Yes	10
15	71	M	No	Tropical beach	10	9	4	8	Yes	10
16	62	F	No	Forest	10	8	4	9	Yes	10
17	44	M	Yes	Forest	10	9	4	9	Yes	10
18	74	M	Yes	Tropical beach	10	9	1	10	Yes	10
19	65	F	No	Tropical beach	10	8	3	10	Yes	10
20	75	F	No	Tropical beach	10	9	4	10	Yes	10

VRH, virtual reality hypnosis; M, male; F, female.

14 patients refused a new procedure under the same conditions versus only 7 in the hypnosis group, and 12 patients asked for general anesthesia in case of a new procedure versus only 7 in the hypnosis group. In our study, 8 out of the 20 patients did have a previous bronchoscopy. The influence of a previous bronchoscopy on the level of anxiety is debated in the literature, with contradictory results (2,19). In the future, a controlled study could also analyze the effect of a previous bronchoscopy, with or without VRH, on anxiety.

Few studies have used VRH to facilitate induction and suggestion and authors report evidence of the effectiveness of VR, suggesting that it does contribute to a decreased fear of medical procedures in some situations (9,20,21). A team reported the use of VR, displaying nature stimuli (22,23), during bronchoscopy in 37 patients and showed an improvement of level of anxiety with VR. However, in this work, comparing to our study, no narrative hypnosis was added. VRH could be preferred for patients who encounter difficulties with traditional hypnosis because it easily focuses attention even for those with a lack of imaginative capacities (24). In contrast, traditional hypnosis typically involves eye-closed self-generated imagery. The other advantage of VRH is that hypnosis is delivered by software which is always available in contrast with traditional hypnosis (which requires a trained operator) and so may be easier to implement compared to standard hypnosis, especially in centers with few resources. Moreover, this device (hardware + software) is not expensive (about 3,000 euros).

Our study has several limitations. First, it is a retrospective study conducted in a single center, based on a satisfaction form, and including a small number of patients. A study with a control group should be performed in order to verify that the anxiety reduction was due to the hypnosis and not to the passage of time. Second, there may be a selection bias, because we only proposed the VRH mask to patients evaluated as highly anxious. However, reducing the level of anxiety is more relevant in this population. Our study is the first report of VRH experience leading to reduce patient anxiety and improve patient satisfaction during bronchoscopy.

## Conclusions

This preliminary report has shown that virtual reality hypnosis was useful to reduce patient anxiety during bronchoscopy under local anesthesia, with a high level of satisfaction from patients, physicians and nurses.

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## Footnote

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*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. This non-interventional study protocol was approved by the Institutional Review Board of Rouen University Hospital (protocol agreement E2020-84). All research was performed in accordance with relevant guidelines and regulations, namely the European Directive 2014/536/EU, the French law 2012-300 regulating biomedical research. This study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). According to Rouen University Hospital Regulation, patients were asked and agreed for the use of their medical record data for medical research and publication.

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