

## Hypnosis and upper digestive function and disease

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### INTRODUCTION

Hypnosis can be defined as an altered state of consciousness, different from both sleep and normal wakefulness, characterized by highly focused attention and heightened compliance with suggestion<sup>[1]</sup>. As a rule, the onset of this state is facilitated by eye closure. A number of other phenomena are often described as associated with hypnosis, including altered perception of passage of time, partial or complete amnesia for the events experienced, and attenuation of stress experiences<sup>[1,2,3]</sup>. In addition, subjects may show enhanced compliance to suggestion given during hypnosis meant to influence favorably their behavior after the trance state has been terminated (post-hypnotic suggestion)<sup>[1]</sup>. Furthermore, a more contentious property of hypnosis is either increased access to memories, feelings, and perceptions which are normally kept below the level of conscious awareness, or vice versa enhanced suppression of these from the conscious mind<sup>[4,5,6]</sup>.

Clinical hypnosis is the method of deliberately inducing the state of hypnosis in a patient through verbal guidance, and making use of its characteristic properties for targeted therapeutic purposes. The possibilities of hypnosis as a healing method stem principally from the heightened responsiveness to suggestion in this altered mental state. Hypnotic and post-hypnotic suggestions can be used to facilitate desired therapeutic changes in feelings, behavior and physiology, and this can be useful not only for mental health purposes but also in medicine<sup>[1]</sup>. Although a single hypnosis session targeting a simple symptom or bodily function can sometimes yield useful results, treatment of complex psychological and somatic conditions with hypnosis typically requires a structured form of therapeutic intervention, hypnotherapy, administered in a series of several therapy sessions<sup>[1]</sup>.

Hypnosis has a long history of application as a clinical tool in medicine, dating back to the early 18th

### Abstract

Hypnosis is a therapeutic technique that primarily involves attentive receptive concentration. Even though a small number of health professionals are trained in hypnosis and lingering myths and misconceptions associated with this method have hampered its widespread use to treat medical conditions, hypnotherapy has gained relevance as an effective treatment for irritable bowel syndrome not responsive to standard care. More recently, a few studies have addressed the potential influence of hypnosis on upper digestive function and disease. This paper reviews the efficacy of hypnosis in the modulation of upper digestive motor and secretory function. The present evidence of the effectiveness of hypnotherapy as a treatment for functional and organic diseases of the upper bowel is also summarized, coupled with a discussion of potential mechanisms of its therapeutic action.

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Century, when it was used with considerable success for the purpose of inducing anesthesia during surgery in thousands of cases, predominantly by British physicians. Only the availability of chemical anesthesia with ether and chloroform in 1846 and 1847 made this application obsolete<sup>[7]</sup>.

In the latter half of the 19th Century, hypnosis became prominently utilized in the treatment of psychiatric conditions like hysteria by some of Europe's foremost authorities in neurology and psychiatry of that time, such as Sigmund Freud in Austria and Jean-Martin Charcot in France<sup>[8]</sup>. Ever since then, hypnosis has been more widely recognized as a treatment aid for mental health problems than for physical ailments. However, medical uses of hypnosis continued, and sufficient experience with various advantageous medical applications gradually accumulated for the technique of clinical hypnosis to earn formal acceptance in mainstream medicine<sup>[7,8]</sup>. Hypnosis gained official approval as a medical treatment, first by the British Medical Association in 1955 and then by the American Medical Association in 1958, in a report that stated that hypnosis had "definite and proper applications in medicine and dentistry", and recommended that physicians should receive training in the technique<sup>[7,8]</sup>. However, even today, most medical school curricula in the U.S. and elsewhere provide no training or education in hypnosis. Although clinical hypnosis is currently practiced by thousands of health professionals in many Western countries, it is practiced by a variety of professional disciplines, including psychologists, counselors, clinical social workers, dentists, nurses and nurse practitioners but relatively few physicians<sup>[7,8]</sup>. In many places, the great majority of practitioners providing hypnosis are mental health professionals who rarely use it to treat physical conditions. Additionally, hypnosis services are commonly offered also by large numbers of lay hypnotherapists without any qualifications or formal education in treating medical problems<sup>[8]</sup>. These limitations, as well as myths, misconceptions and apprehensions that still linger in the public's mind from the exploitation and inaccurate portrayal of hypnosis in stage shows, movies and other popular media, has continued to hamper a widespread proper medical use of hypnosis.

Nonetheless, several medical applications of clinical hypnosis have been sufficiently investigated and considered effective in multiple formal studies. A review by a 1995 National Institutes of Health panel in the U.S. concluded that there is "strong evidence for the use of hypnosis in alleviating pain associated with cancer"<sup>[9]</sup>. Published systematic reviews of randomized clinical trials have also deemed hypnosis to be effective for treating nausea and vomiting associated with cancer chemotherapy<sup>[10]</sup> as well as the most promising psychological treatment for controlling procedure-related pain and distress in children and adolescents<sup>[11]</sup>. Furthermore, three separate systematic reviews published in the past three years<sup>[12-14]</sup> have concluded that hypnotherapy is an effective treatment for irritable bowel syndrome.

Research on the use of hypnosis for gastrointestinal

disorders began with a randomized placebo-controlled study of hypnotherapy for treatment-refractory irritable bowel syndrome (IBS) in England, published in the *Lancet* in 1984<sup>[15]</sup>. In this study, by Peter Whorwell and colleagues in Manchester, England, the investigators randomly allocated 30 patients with IBS which was refractory to standard medical care, to either seven sessions of hypnotherapy or to the same amount of supportive psychotherapy plus placebo pills. The hypnosis approach used was a structured intervention developed by this Manchester team called gut focused hypnotherapy. This technique aims primarily to normalize disordered bowel function, but additionally provides relaxation, coping skills, and ego-strengthening suggestion<sup>[16]</sup>. After the treatment, the patients in the hypnosis group showed substantial improvement in all cardinal IBS symptoms, and were significantly more improved on all outcome variables than the supportive psychotherapy group<sup>[15]</sup>. In a later paper, the investigators reported that the benefits of hypnotherapy in the same group of patients persisted up to 18 months<sup>[17]</sup>.

This study, albeit small, was a landmark trial, demonstrating for the first time the substantial possibilities that hypnosis offers for ameliorating gastrointestinal symptoms. Since then, positive results on the efficacy of hypnotherapy as a treatment for IBS have been reported by independent investigators both in uncontrolled and controlled trials (Table 1)<sup>[18-22]</sup>. The Manchester group has created a Hypnotherapy Unit, where this mode of therapy is routinely offered to functional GI patients who do not gain satisfactory benefit from more conventional medical treatment<sup>[16]</sup>. This group recently reported the long-term outcomes of the first 250 IBS patients treated in their clinic<sup>[22,23]</sup>. The results show an impressive 71% overall response rate to treatment, more than 50% average reduction in bowel symptom severity, and with four out of five treatment responders maintaining the full therapeutic benefit for one to five years after treatment termination<sup>[22,23]</sup>.

The Manchester group has also expanded their experience from IBS therapy to other functional bowel disorders<sup>[16]</sup>. They demonstrated that functional esophageal disorders and functional gastroduodenal disorders are also suitable targets for hypnotherapy, with equally satisfactory results (Table 1)<sup>[24,25]</sup>. A small, but significant group of papers now provides evidence that hypnosis and hypnotherapy may effectively influence upper digestive function and disease. The aim of this review is to focus on this literature and to highlight the potential of hypnotherapy as a treatment option for upper digestive functional disorders.

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## HYPNOSIS AND UPPER DIGESTIVE FUNCTION

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Gastric acid production is the bowel function where the influence of hypnosis was first investigated<sup>[26,27]</sup>. In the past, gastric acid secretion was an important research domain for gastroenterologists and its responsiveness to

Table 1 Randomized Controlled Trials of Hypnosis Treatment for Severe Functional Bowel Disorders

Authors & year	No. of Patients	Control Treatment	Positive Outcome	Follow-up (mo)
A : Irritable Bowel Syndrome				
Whorwell <i>et al</i> (1984)	30	Psychotherapy plus Placebo Pill	Hypnosis 100% $P < 0.0001$	12
Galovski & Blanchard (1998)	11	Waiting List	Hypnosis 82% $P = 0.016$	2
Palsson <i>et al</i> (2002)	24	Waiting List	Hypnosis 87% $P = 0.002$	10
B : Functional Dyspepsia				
Calvert <i>et al</i> (2002)	126	Psychotherapy plus Placebo Pill or Ranitidine 300 mg daily	Hypnosis 73% vs Placebo $P < 0.02$ vs Ranitidine $P < 0.01$	14
C: Non-Cardiac Chest Pain				
Jones <i>et al</i> (2006)	28	Psychotherapy plus Placebo Pill	Hypnosis 80% $P = 0.008$	4

Note: Randomized controlled studies run in primary care are not reported for different patient population

emotions and psychological stress were documented<sup>[28,29]</sup>. This interest was driven by the belief that peptic ulcer disease was a psychosomatic disease and excess gastric acid secretion the pathophysiological mechanism linking emotion to the disease<sup>[30,31]</sup>. As a consequence, acid secretion was an attractive parameter to attempt to influence by hypnosis. A few studies were published in the nineteen sixties and early seventies examining the gastric secretory responses to hypnotic conditions, where either food-related (hunger-eating) or emotion-related (sleep-relaxation) suggestions were provided<sup>[27-29]</sup>. These early studies were flawed by small samples and questionable research methodology, and produced contradictory results. In 1989, however, Klein and Spiegel published a well designed trial investigating the ability of hypnosis to modulate gastric acid secretion in highly hypnotizable healthy volunteers, as defined by accepted scales of trance depth<sup>[32]</sup>. The study was conducted in two Centers, by two experienced hypnotherapists using two different hypnosis induction techniques. After naso-gastric intubation, gastric secretion was measured both basally and after pentagastrin stimulation in two separate studies. In the first study (acid stimulation test), acid secretion was collected in 28 subjects (13 females, age range 18-60 years) after hypnotic instructions to visualize and eat the most delicious meal possible. All the sensory aspects of the eating process, including food appearance, aroma, texture and taste, were explored and reinforced by hypnotic suggestions from the therapist. The second study consisted of two separate sessions that were held in random order. In the no-hypnosis session, the peak acid output (PAO) was obtained after maximal Pentagastrin stimulation in 17 subjects (7 females, age range 18-60 years), but hypnosis was not provided. The procedure for the hypnosis sessions was the same, but deep muscle relaxation and intense imagery to divert one's attention from eating were provided. Imagery involved either lying on a beach, watching a sunset, or meeting a friend somewhere else. In both studies, none of the subjects reported difficulty in following the hypnotic suggestion or adverse side effects. Hypnotic suggestion of eating significantly increased gastric acid output compared to basal conditions<sup>[32]</sup>. In addition, the pentagastrin-stimulated PAO was significantly lowered in the averting-food hypnosis condition compared to the no-hypnosis session<sup>[32]</sup>. The authors concluded that

gastric acid secretion may be modulated by hypnosis in highly hypnotizable subjects. Treatment mechanisms of action were left unexplored, but the authors postulated that hypnosis influenced cognitive processing within the central nervous system<sup>[32]</sup>. Since the relevance of gastric secretion in peptic ulcer disease has diminished, no other Centers have tried to replicate these positive results.

Two additional studies have evaluated the influence of hypnosis on upper digestive transit. In 1991 Beugerie *et al.* studied the ability of hypnosis to modulate the oro-caecal transit time of 10 g lactulose in six healthy volunteers<sup>[33]</sup>. Oro-caecal transit time was measured by the hydrogen breath test. Oral ingestion of a poorly absorbable carbohydrate (lactulose) results in a sustained rise in breath hydrogen, which occurs within minutes of the substrate entering the cecum<sup>[34]</sup>. The oro-caecal transit time is the interval elapsing from the ingestion of the substrate to the evidence of a persistent increment in breath hydrogen concentration<sup>[34]</sup>. It is commonly considered a non-invasive, reliable index of small bowel transit, particularly when lactulose is included in a caloric meal to securely interrupt the fasting motility pattern of the small bowel<sup>[35]</sup>. The subjects in this trial were recruited irrespectively to their hypnotizability, but two of them had previously been hypnotized. Oro-caecal transit was evaluated on three occasions in random order: (A) control session without hypnosis, (B) hypnotic session with suggestion of deep relaxation, (C) hypnotic session with visualization of a cascading waterfall to promote transit acceleration<sup>[33]</sup>. All hypnosis sessions were started just before oro-caecal transit and maintained till the transit time elapsed. The mean oro-caecal transit time was significantly longer during the hypnotic relaxation session compared to the control session<sup>[33]</sup>. On the contrary, the hypnotic acceleration session did not result in significant modification of small bowel transit time<sup>[33]</sup>. The small sample size and the limited breath technique used (lactulose not administered together with a caloric test meal) did flaw the results of this study. However, it was the first study showing an influence of hypnosis on upper digestive function in individuals not selected for high hypnotizability.

The potential influence of hypnosis on gastric emptying rates has been evaluated only recently, by Chiarioni and coworkers in Italy<sup>[36]</sup>. In this study, the gastric emptying rate of a typical Mediterranean meal

(pasta with meat sauce, cheese, bread) was tested by a non-invasive ultrasonography technique. Real-time ultrasonography was used to measure the diameters of the gastric antrum in the sagittal plane passing through the aorta. Serial measurements were taken before the meal, immediately after eating and at 30 min intervals thereafter to obtain total emptying time of the meal. The total emptying time of the meal has been validated as reliable index of gastric motor function both in health and in disease when compared with total emptying time measured by gastric scintigraphy<sup>[37]</sup>. Gastric emptying rates and epigastric sensations were evaluated in 11 healthy volunteers from the hospital staff and in 15 patients with severe functional dyspepsia unresponsive to standard care under three conditions according to a fixed schedule to avoid a carry-over effect: (A) basal session, (B) prokinetic drug session (Cisapride 10 mg po 30 min before meal), and (C) hypnosis session (90 minutes hypnosis session 30 minutes after finishing meal). An additional session was run in eight healthy volunteers while listening to relaxing music, to address the potential influence of both repeated testing and posture. Cisapride is a prokinetic agent that has been shown to significantly improve both gastric emptying and symptoms in functional dyspepsia compared to placebo, before being withdrawn from the market for its cardiovascular side-effects<sup>[38,39]</sup>. The method of progressive relaxation by verbal suggestion was used for hypnosis induction. Techniques to deepen the hypnosis included induction of limb heaviness and warmth. The hypnotically warmed hand was then placed over the epigastrium to associate suggestion of improved well being and gastric function mediated by the warmth of the hand. Imagery was provided of water flowing in a river and in a waterfall. This was related to suggestions for improved well-being and gastric function, derived from the gut-oriented suggestions developed by the Manchester group to treat irritable bowel syndrome<sup>[16]</sup>. The hypnosis session was completed by the classic Hartland's ego-strengthening technique, providing direct and broad hypnotic suggestions to increase the patient's confidence<sup>[40]</sup>. In patients with functional dyspepsia, gastric emptying was significantly shortened by Cisapride and even more by hypnosis compared to the basal session<sup>[36]</sup>. In healthy volunteers, gastric emptying was significantly accelerated by hypnosis, but not by Cisapride, compared to the basal session<sup>[36]</sup>. The relaxing music session did not influence gastric emptying rates. Epigastric sensations (*i.e.* fullness and discomfort) were significantly improved by hypnosis in the dyspeptic patients, but not by cisapride<sup>[36]</sup>. Interestingly, symptomatic improvement did not correlate with improved gastric motor function, leaving the mechanism/s of action of hypnosis unexplained<sup>[36]</sup>. Limitations of the study were lack of randomization and the highly selected study population.

## HYPNOTHERAPY TO TREAT UPPER DIGESTIVE DISEASES

Hypnotherapy delivered as a structured, multi-session

focused intervention has been most extensively used to treat IBS according to the protocols of the Manchester group or the North Carolina group<sup>[13,16]</sup>. However, the Manchester group has also provided experimental evidence to support the use of hypnotherapy in some upper digestive diseases. The first of these was a controlled study to prevent relapse of peptic ulcer<sup>[41]</sup>. The investigation was published in 1988 when peptic ulcer was considered to be a psychosomatic disorder caused by increased gastric secretion<sup>[30,31]</sup>. Thirty patients with frequently relapsing duodenal ulcer were randomized to receive either seven sessions of gut-focused hypnotherapy plus Ranitidine 150 mg twice daily or seven routine consultations at GI Clinic without hypnosis plus the same Ranitidine dosage over a 10-week interval<sup>[41]</sup>. Hypnosis was induced with an arm-levitation technique followed by a combination of standard deepening procedures. The subject was then asked to place her/his hand over the abdomen, feel a sense of warmth beneath the hand and relate this to the control of gastric secretions. Reinforcement by visualization was used depending on the patient's ability. Patients were also given an audio tape for daily autohypnosis. At one year follow-up, all the subjects in the no-hypnosis group had relapsed while only 53% in the hypnotherapy group showed endoscopic evidence of relapsing duodenal ulcer<sup>[41]</sup>. The authors concluded that hypnotherapy is helpful in maintaining remission in those patients with peptic ulcer who are prone to relapse<sup>[41]</sup>. Shortly after the study, consensus developed that *Helicobacter Pylori* infection of the stomach is the primary cause of peptic ulcer disease, and hypnotherapy was therefore not pursued further as potential treatment for peptic disease<sup>[42]</sup>. Nonetheless, this remains the first study to investigate the efficacy of hypnotherapy to treat upper digestive diseases.

Recently, the Manchester group assessed the efficacy of hypnotherapy for upper digestive functional diseases in two controlled trials; one on functional dyspepsia (FD) and the other for non-cardiac chest pain (NCCP)<sup>[24,25]</sup>. Functional dyspepsia refers to symptoms thought to originate in the gastroduodenal region in the absence of any organic or metabolic disease that is likely to explain the symptoms<sup>[43]</sup>. Postprandial fullness, early satiety, epigastric pain and/or burning may be reported as symptoms in FD<sup>[43]</sup>. Delayed gastric emptying, abnormal gastric tone, altered visceral perception, and autonomic imbalance have all been considered as potential etiologic factors<sup>[43,44]</sup>. In addition, comorbidity with psychiatric disorders, especially anxiety disorders, is reported to be high in FD<sup>[45]</sup>. Up to 30% of people in the community report having dyspeptic symptoms each year<sup>[43,45]</sup>. Symptomatic drug treatment, especially proton pump inhibitor medications, are often used for FD symptoms, but the results are unsatisfactory<sup>[43,44,46]</sup>. To investigate the efficacy of hypnotherapy in FD, Calvert and coworkers randomly assigned 126 FD patients to receive either 12 hypnotherapy sessions, supportive therapy plus placebo tablets, or medical treatment with Ranitidine 150 mg twice daily<sup>[24]</sup>. Patients underwent a 16-week treatment

phase followed by a 40-week follow-up phase where no further study interventions were undertaken. Hypnosis was induced using eye fixation followed by progressive muscular relaxation and deepened by standard procedures. The patients were then asked to place their hand on their abdomen and imagine a reduction of all symptoms. Suggestions of improvement in gastric motor function, sensitivity and gut secretion activity were also given. Reinforcement by appropriate visualization processes were administered as well. At the short term follow-up (16 weeks), hypnotherapy significantly ameliorated symptoms compared to both the supportive therapy and the medical treatment groups<sup>[25]</sup>. Analogous improvements were observed when quality of life scores (QOL) were considered. Anxiety scores were lower after hypnotherapy, but there was no correlation between improvement in anxiety and FD symptom improvement<sup>[24]</sup>. No differences were evident between groups in terms of depression scores. Improvement in FD symptoms and QOL were well maintained at long term follow-up (56 weeks)<sup>[24]</sup>. In addition, patients in the hypnotherapy group were significantly less likely to consult the referring physician and to establish additional drug treatments than were the subjects in the other two groups<sup>[24]</sup>. The authors concluded that hypnotherapy is an effective treatment for functional dyspepsia both in the short and long term, but the mechanism/s of action remained speculative<sup>[24]</sup>. Hypnotherapy seems also to be cost-effective for the observed reduction in medication use and consultation rate at long term follow-up. This study was methodologically sound by most standards: (A) study design and sample size were both adequate, and (B) the double placebo control condition plus the standard care arm were likely to have produced a high expectation of therapeutic effect. Replication of these positive results by independent investigators is eagerly awaited.

Recently, the Manchester group has extended the application of hypnotherapy to non-cardiac chest pain, a condition later redefined as functional chest pain of presumed esophageal origin by the Rome III Committee<sup>[25,47]</sup>. This functional disorder refers to relapsing episodes of unexplained chest pain that is usually located in the midline of the chest and of visceral quality<sup>[47]</sup>. The pain involved may be similar in nature to the one reported by angina patients, and by those affected by other esophageal disorders including achalasia and gastro-esophageal reflux disease (GERD)<sup>[47]</sup>. To diagnose functional chest pain, heart disease needs to be excluded as well as structural esophageal diseases, GERD, and esophageal motility disorders with defined histopathologic bases (*i.e.* achalasia, scleroderma of the esophagus)<sup>[47]</sup>. Epidemiology of functional chest pain is ill defined, but one should consider that 15-30% of coronary angiograms performed for chest pain are negative for ischemic heart disease<sup>[47,48]</sup>. Disordered esophageal motility, altered visceral perception, and abnormal central signal processing with secondary errors in autonomic response have all been reported, alone or in combination, as potential causative factors<sup>[47]</sup>. In addition, overrepresentation of psychiatric disorders,

particularly depression, anxiety and somatization disorders, have been described in functional chest pain of presumed esophageal origin<sup>[49]</sup>. Quality of life is impaired in continued pain and spontaneous recovery is rare<sup>[47]</sup>. In these patients, a therapeutic trial with proton pump inhibitors is mandatory to exclude symptomatic reflux disease<sup>[50]</sup>. Antidepressants may be of help, but their continuous use is associated with a high rate of side effects<sup>[47,51]</sup>.

To address the effect of hypnotherapy in NCPP, the Manchester group randomized 28 patients with functional chest pain to receive either 12 sessions of individualized hypnotherapy or 12 sessions of supportive listening plus placebo tablets to control for expectancy and equalize the amount of time spent with a clinician<sup>[25]</sup>. All the patients were referred by the local cardiothoracic center after negative coronary angiography for angina-like chest pain. Reflux disease as a potential causative factor of chest pain was excluded in all subjects either by normal 24 hour pH monitoring or by non-responsiveness to a proton pump inhibitor trial. Hypnosis was induced by eye closure, followed by progressive muscle relaxation and deepened by standard techniques. Suggestions focused on improved esophageal functioning and sensitivity were then introduced by using both imagery and conditioning techniques. In addition, direct suggestions of reduced pain and improved general health were given on a repetitive basis at each session. After treatment, 80% of patients in the hypnotherapy group described their chest pain as completely better or moderately better, compared to only 23% of patients in the control group<sup>[25]</sup>. This benefit persisted long-term (2 years), as reported by the authors in a follow-up paper<sup>[52]</sup>. Hypnotherapy also resulted in a significantly greater reduction in pain intensity scores, greater improvements in quality of life, and a greater reduction in medication usage when compared to the control treatment<sup>[25]</sup>. There were no significant differences between treatment groups in terms of improvement of either anxiety or depression scores as assessed by the Hospital anxiety and depression scale<sup>[25]</sup>.

Limitations of this trial include the small sample size and the high patient selection. As in previous studies, the mechanism of action of hypnosis was left unexplored in this study. However, it remains the only randomized trial to show that hypnotherapy is effective treatment for functional chest pain, a disabling disorder that responds poorly to conventional care. Therefore, additional larger studies evaluating the effect of hypnotherapy on functional chest pain of presumed esophageal origin should be pursued.

## MECHANISM OF ACTION OF HYPNOSIS AND HYPNOTHERAPY

The mechanism of action of hypnosis is ill defined, but we may speculate that many factors possibly contribute to its influence on physiological function and symptoms in the upper digestive tract. Abnormal motor activity and

altered autonomic function have both been reported in functional gastroduodenal and esophageal diseases<sup>[43,47]</sup>. In functional dyspepsia, delayed gastric emptying seems particularly common in patients complaining of nausea, fullness and vomiting, but this is controversial<sup>[43,53]</sup>. Other disturbances of gastroduodenal motility have been described in functional dyspepsia (*e.g.* antral hypomotility, gastric dysrhythmia, reduced frequency of interdigestive migrating motor complexes), but their relationship to the symptoms are less documented<sup>[43]</sup>. On the contrary, evidence of increased gastric visceral perception (so-called hypersensitivity) in a subset of functional dyspepsia patients is well documented in the literature<sup>[43,54]</sup>. This altered perception may be mediated by the autonomic imbalance both on a cortical and a peripheral level often described in functional bowel disorders<sup>[55]</sup>. Hypnosis induces a state of profound relaxation consistent with a generalized decrement in sympathetic nervous system activity<sup>[1,3]</sup>. This relaxation response is not specific to hypnosis but may be induced by different techniques such as autogenic training, yoga, and meditation<sup>[3]</sup>. The physiological changes of the relaxation response include simultaneous lowering of blood pressure, heart and respiratory rates, which are opposite to those induced by stressful events<sup>[3]</sup>. These changes are actually distinct from those observed during sleep and characterize a wakeful hypometabolic state<sup>[56]</sup>. In addition, the relaxation response seems to last longer than the actual hypnosis interval<sup>[3]</sup>. A distinct feature of the relaxation response is that its action seems mediated through a reduction in epinephrine end-organ responsivity<sup>[3]</sup>. Stress has been shown to increase gastric acid secretion and it used to be considered a risk factor to developing peptic ulcer disease<sup>[30,57]</sup>. We may speculate a potential influence of hypnosis on gastric secretion through modulation of the sympathetic tone. In addition, experimental stress delays gastric emptying and increases plasma levels of noradrenaline plus accelerating small bowel transit<sup>[58-60]</sup>. Therefore, the capability of a single session of hypnosis either to accelerate gastric emptying or to slow small bowel transit may be secondary to the relaxation response. However, a recent study investigating hypnosis mechanisms of action showed that hypnotherapy did not change cardiovascular responses in IBS<sup>[23]</sup>. The only parameter of sympathetic tone that was significantly decreased by hypnotherapy was skin conductance, a measure reflecting sweat gland responses to stress<sup>[23]</sup>.

The effect of hypnosis in gastric visceral sensitivity has not been investigated. However, in IBS the influence of hypnotherapy on rectal perception has been evaluated with controversial results. The Manchester group provided experimental evidence that hypnosis improved rectal sensitivity, but this was not confirmed by a recent study by the North Carolina group<sup>[25,61]</sup>. In addition, one should consider that significant symptom improvement has been reported in functional bowel diseases without correlating with gut sensorimotor functioning modifications<sup>[23,36,12]</sup>. Therefore, the symptomatic improvement observed after hypnosis should also be

related to some modulation of perception at a cortical level. Brain imaging studies have shown a variety of alterations in cortical activation pattern to visceral sensitive stimulation (rectal distension, esophageal distension and acid perfusion) in patients with functional bowel disorders compared with controls<sup>[62]</sup>. However, a consistent finding has been the reported excessive activation of the anterior cingulate cortex where the affective response to pain is elaborated<sup>[62]</sup>. It has also been shown that non-painful esophageal distension activated the somatosensory and anterior cingulate cortex while visual stimulation activated a different central area (visual cortex), thus postulating a more specific response to visceral stimulation<sup>[63]</sup>. Studies on somatic pain have shown that hypnosis is capable of decreasing reported pain sensation in response to pain-inducing stimuli, while the neurophysiological reactions of spontaneous and evoked EEG were unaffected (*i.e.* cerebral potentials were modified as the subject was actually feeling pain)<sup>[64]</sup>. Further supporting evidence have been given by studies on somatic pain analgesia where hypnosis reduced activity of the anterior cingulate cortex, but not that of the somatosensory cortex<sup>[65]</sup>. This dissociation of sensory and affective components of pain under hypnosis would also be consistent with the new “dissociation theory” to explain the effectiveness of hypnotherapy in psychopathology<sup>[1,8,66]</sup>. There is growing evidence that patients with IBS, functional chest pain and probably functional dyspepsia show increased levels of vigilance toward gut pain related sensations, easily interpreting them as symptoms of disease as a consequence<sup>[62,67,68]</sup>. Modulating the affective component of pain ratings may be one of the therapeutic mechanisms of hypnotherapy in functional bowel disease.

An additional reason for the effectiveness of hypnotherapy in functional bowel diseases could be related to the focus of many protocols on reducing the catastrophising cognitions commonly present in these patients<sup>[67,68]</sup>. Gonsalkorale and coworkers reported that hypnotherapy improved symptom-related cognitions in IBS by using a dedicated cognitive scale<sup>[69]</sup>. In this study, improved cognitive scores correlated with symptomatic improvement<sup>[69]</sup>. Finally, the role of the placebo effect of hypnotherapy needs to be considered in producing the beneficial hypnotherapy outcomes observed. In many hypnotherapy trials patients affected by severe, unremitting symptoms of functional bowel disorder have been included<sup>[13,24,25,36]</sup>. The motivation to undergo a new treatment and therapy expectancy in these patients are predicted to be high<sup>[70]</sup>. In addition, the most powerful placebo effect is to be expected in patients suffering from chronic pain syndromes<sup>[70]</sup>. In this context, the placebo effect is stronger when complex interventions such as hypnotherapy are provided<sup>[70]</sup>. Unfortunately, to undertake a double blind controlled trial of treatments such as hypnotherapy is almost impossible because the recipient will know what treatment is provided and establishing a sham hypnosis therapy is not doable<sup>[16]</sup>. Therefore, appropriate control treatments (*e.g.* supportive

listening and placebo pills) are desirable options when designing a meaningful trial of hypnotherapy<sup>[13,16]</sup>. However, the results of such placebo-controlled studies conducted so far on hypnosis for IBS<sup>[15,24]</sup> and FD, using a powerful double placebo of inert pills combined with supportive listening, suggest that the placebo effect only plays a small role in the therapeutic impact of hypnotherapy on these conditions.

## LIMITATIONS OF HYPNOTHERAPY IN UPPER DIGESTIVE DISEASES

Only two studies, coming from the same Center, have tested the efficacy of hypnotherapy in the treatment of upper digestive functional diseases<sup>[24,25]</sup>. These studies provide encouraging evidence that hypnotherapy is effective treatment for functional dyspepsia and functional chest pain of presumed esophageal origin<sup>[19,20]</sup>. However, these results need to be replicated in less selected populations and by independent investigators before a more widespread use of hypnotherapy to treat upper digestive dysfunction can be recommended. In addition, hypnotherapy is a time consuming, labor intensive and costly treatment, and the number of health care providers trained in hypnosis is limited. Non-medical qualified hypnotherapists and hypnosis audiotapes may reduce costs, but the effectiveness of these alternative delivery methods on outcomes have not been thoroughly investigated<sup>[13,16]</sup>. Specific knowledge in gut directed hypnosis is required to obtain successful outcomes in treating gastrointestinal disorders, and such training has not been widely available<sup>[13,16]</sup>. In an effort to overcome this problem, some Centers are providing gut focused hypnosis scripts to treat IBS<sup>[13]</sup>. Finally, skepticism by some patients and physicians about the use of a psychological intervention for a gut disease may deter them from trying this treatment option. This may be particularly true for hypnosis because of the aura of magic and mystery associated with it.

## CONCLUSION

Hypnosis is an altered state of consciousness characterized by highly focused attention and heightened compliance with suggestion<sup>[1]</sup>. Clinical hypnosis can be used to treat a range of complex psychological or somatic diseases, but this generally requires a structured form of hypnotherapy intervention consisting of several sessions<sup>[1,8]</sup>. Hypnosis has a long history of applications in medicine, and is now formally recognized as a valuable aid for various medical problems. However, a limited number of health professionals offer hypnotherapy for medical problems, and it has traditionally been hampered by misconceptions shrouding this psychological intervention<sup>[8,16]</sup>. Yet, sufficient evidence has amassed over the years to firmly support the effectiveness of hypnotherapy for various pain problems, as well as to treat IBS, a complex and prevalent functional disorder of the lower bowel<sup>[12,13,16]</sup>. Recently, a few studies have

addressed the potential influence of both single-session hypnosis and a course of hypnotherapy on upper digestive function and diseases with encouraging results.

Hypnosis delivered on a single session by an expert therapist has been shown capable of modulating gastric secretion and accelerating gastric emptying in healthy volunteers<sup>[32,36]</sup>. In addition, hypnosis has improved gastric emptying and epigastric sensations in severe functional dyspepsia<sup>[36]</sup>. Small bowel transit may also be influenced by hypnosis<sup>[33]</sup>.

In the past, hypnotherapy has been used with a successful outcome to decrease the relapsing rate of peptic ulcer disease<sup>[41]</sup>. More recently, two randomized controlled trials have shown hypnotherapy to be a highly effective treatment for functional dyspepsia and functional chest pain of presumed esophageal origin unresponsive to standard care<sup>[24,25]</sup>. In both of these upper gastrointestinal diseases, clinical benefits were well maintained at long-term follow-ups<sup>[24,52]</sup>. However, both of these studies were carried out by the same research team -- the Manchester group in England<sup>[16]</sup>. Additional well designed studies from independent investigators are eagerly awaited to substantiate the efficacy of hypnotherapy in this domain.

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