IJC Heart & Vasculature 38 (2022) 100930

Contents lists available at ScienceDirect

IJC Heart & Vasculature

journal homepage: www.sciencedirect.com/journal/ijc-heart-and-vasculature

Correspondence

Arrhythmia conversion to sinus rhythm during a hypnosis: Is hypnosis a normal bystander or a guilty accomplice?

According to the American Psychological Association, hypnosis is "a state of consciousness involving focused attention and reduced peripheral awareness characterized by an enhanced capacity for response to suggestion" [1]. While understanding of the neurophysiology of hypnosis has gradually been increasing thanks to neuroimaging and electrophysiological studies [2], its effectiveness in the medical field has already been widely demonstrated. One area in which it has proven to be particularly useful is that of the management of *peri*-procedural pain and anxiety [3,4]. Some studies have demonstrated the potential benefits of hypnosis in the field of cardiology, such as in the treatment of hypertension or the management of *peri*-procedural stress [5]. In the field of arrhythmia, a recent randomized controlled trial showed that hypnosedation (i.e. hypnosis in combination with sedation) is effective for alleviating pain in patients undergoing atrial flutter ablation, and allows opioid dosage reduction [6]. Nevertheless, its usefulness for arrhythmia management still remains to be explored. In Geneva University Hospitals, the practice of hypnosis began in the 70 s for the treatment of burn-induced pain [7]. Its progressive implementation finally led to the creation of a "hypnosis program". In this frame, more than 200 healthcare workers having received a basic training in clinical hypnosis and a dozen hypnotherapists certified as trained and competent by the Swiss Medical Society of Hypnosis, constituent society of the European Society of Clinical Hypnosis, member of the International Society of Hypnosis. In this correspondence, we present two clinical situations that suggest a potential role of hypnosis in triggering a cardioversion to sinus rhythm (SR) in supraventricular arrhythmias.

1. Case reports

A 69-year-old man with a history of hypertension and unstable angina was admitted for a coronary artery bypass grafting. Forty-eight hours post-surgery the patient developed unstable atrial fibrillation (AF; Fig. 1A). Electrical cardioversion failed to restore SR (hypertension could well have played a role in this failure) [8]. Intravenous amiodarone, followed by oral maintenance therapy was necessary to control the ventricular rate. Albeit rate-controlled, the AF persisted, as did a generalized anxiety. To cope with anxiety, the patient underwent hypnosis on day 6 post-CABG. During the session, the patient felt relaxed and at ease and following the session, he had the impression that his heartbeat had returned to normal. The ECG showed conversion to SR (Fig. 1B).

A 24-year-old woman with a history of Gitelman Syndrome, Hashimoto thyroiditis, and depressive disorder was admitted to the emergency department for abdominal pain occurring in the context of a viral gastroenteritis. Clinical evolution was rapidly favorable. The patient, nevertheless, demonstrated psychomotor agitation and anxiety, and suddenly developed a stable paroxysmal supraventricular tachycardia; the ECG was characterized by regular R-R intervals and retrograde P waves at the end of the QRS interval, compatible with atrioventricular nodal reentrant tachycardia (AVNRT; Fig. 2A). Carotid sinus massage failed to restore SR and due to the lack of patient collaboration, the Valsava manoeuver was not attempted. Whilst preparing adenosine for the treatment of tachycardia, the patient was offered hypnosis for stress reduction. During hypnosis the patient felt calmer and more comfortable and the normalization of the heart rate and the restoration of SR was observed on the monitor. The conversion of tachycardia to SR avoided adenosine administration (Fig. 2B).

2. Discussion

Our clinical cases suggest that hypnosis could be a useful, "integrative tool", in the management of arrhythmia in anxious patients. Evidence regarding its effectiveness is however scarce [9,10].

A 2008 retrospective cohort study showed that hypnosis could lower the incidence of post-operative atrial fibrillation (POAF) after coronary artery bypass surgery; [11] POAF, a frequent complication of cardiac surgery, is likely related to transient post-surgery phenomena, e.g. adrenergic activation induced by psychological/physical stress [12]. Besides the aforementioned paper by Garcia et al. [6], it has been recently demonstrated that hypnosis (hypnotic communication) is more effective than conventional analgesia in reducing perceived pain and anxiety during AF ablation [13], and the implantation of a subcutaneous implantable cardioverter defibrillator [14]. AVNRT is the most common type of paroxysmal supraventricular tachycardia, accounting for approximately 50,000 emergency department visits each year in the USA [15], even so, hypnosis has never, as yet, been studied as a potential treatment for AVNRT.

From a pathophysiological point of view, the effect of hypnosis on cardiac arrhythmias is still little understood although the modulation of the autonomic nervous system (ANS) seems to play a key role. Autonomic dysfunction and/or an imbalance between sympathetic and parasympathetic tone plays a clear role in the pathogenesis of arrhythmias such as ventricular arrhythmias or even sudden death [16,17]. The mechanisms by which the ANS is either arrhythmogenic or on the contrary antiarrhythmic are complex and specific for each arrhythmia. In AF, for example, the simultaneous activation of both the sympathetic and parasympathetic tone is the most common trigger [18].

Hypnosis is effective in the reduction of anxiety and psychological

https://doi.org/10.1016/j.ijcha.2021.100930
Received 14 October 2021; Received in revised form 25 November 2021; Accepted 14 December 2021

Fig. 1. A. ECG before hypnosis showing atrial fibrillation. B. ECG after hypnosis showing conversion to SR.

stress, and is capable of influencing both the hypothalamic–pituitaryadrenal axis [19], and modulating the ANS by increasing the parasympathetic tone and decreasing the sympathetic tone [20,21]. Furthermore, a link between psychological stress and variations in the autonomic nervous system has been widely demonstrated [22,23]. How hypnosis affects the ANS is still largely unknown. The anterior cingulate cortex could well play a pivotal role as it is both involved in trance states (its dorsal portion activity is reduced during hypnosis), and represents one of the key cortical structures of the autonomic central network [24]. It is thus conceivable that changes in the activity of the cingulate cortex could be responsible for ANS modulation, which is reflected in the physiological changes commonly seen during hypnosis (e.g. heart rate deceleration, blood pressure decrease, muscle relaxation). Anxiety, however, can negatively affect autonomic modulation and create an arrhythmogenic substrate capable of promoting AF [23]. Therefore, one can easily conceive that hypnosis could be instrumental in managing cardiac arrhythmias by the modulation of this ANS-driven arrhythmogenic effect.

The fact that conversion to SR occurred during hypnosis, does generate the hypothesis that it could be particularly beneficial for arrhythmias associated to, or triggered by, anxiety (like AF and PSVT). When performed by competent practitioners, adverse reactions in hypnosis are rare, minor (e.g. emergence of strong affects, like anxiety and headaches) and reversible [25]. We therefore believe that hypnosis is a safe tool that could be easily offered to all willing patients. Further studies are still needed however, to clarify whether hypnosis could play a role in the acute management of cardiac arrhythmias.

Notwithstanding its many "somatic" indications stemming from robust evidence [26], hypnosis is still underused in clinical practice with misconceptions and misunderstandings still standing in the way [27].

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

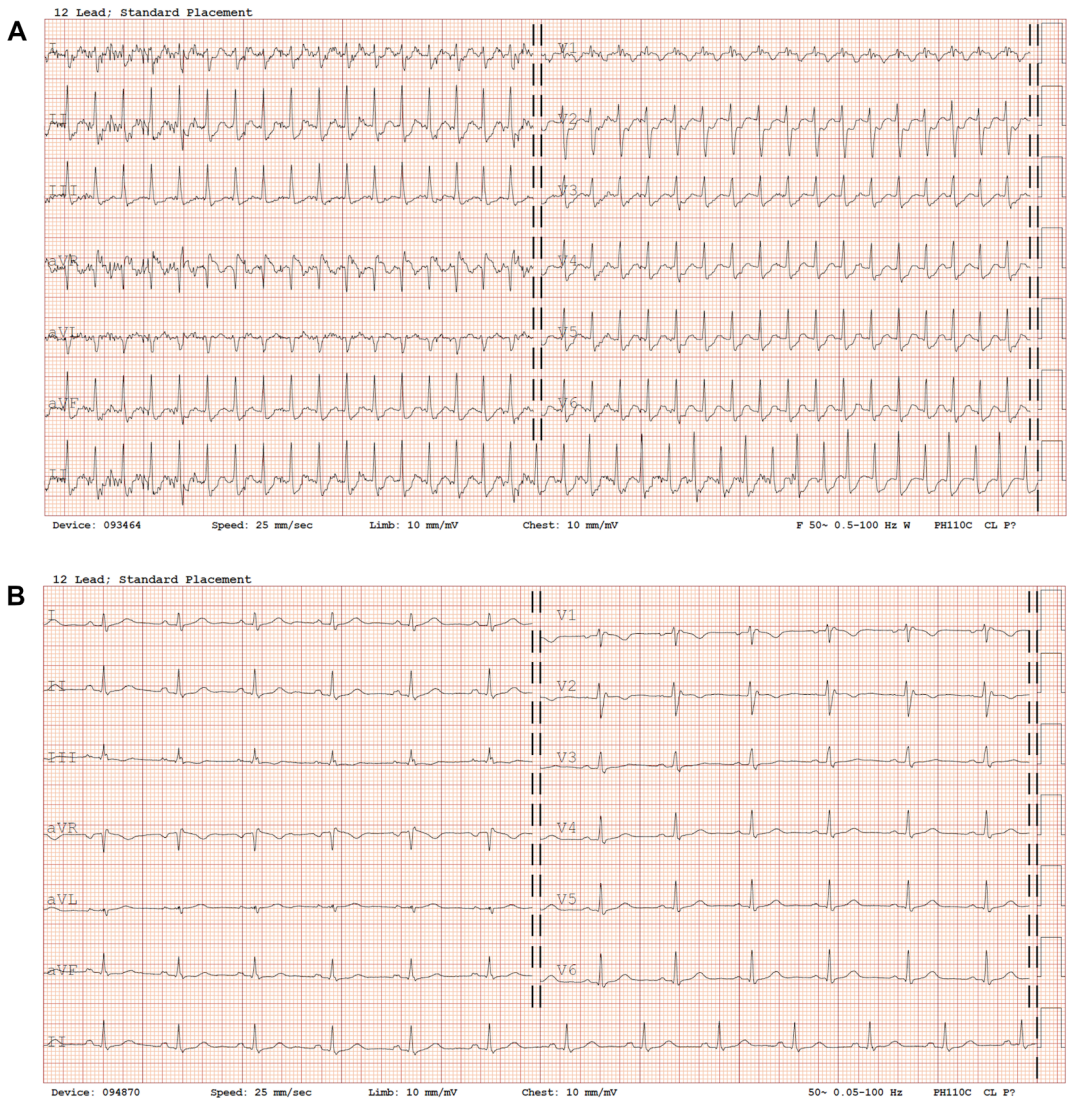

Fig. 2. A. ECG before hypnosis showing supraventricular tachycardia (the regular R-R intervals and retrograde P waves at the end of the QRS interval are compatible with AVNRT). B. ECG after hypnosis showing conversion to SR.

Acknowledgements

The Authors would like to thank Tamara Mann for help in reviewing the manuscript in English.

References

[1] G.R. Elkins, A.F. Barabasz, J.R. Council, D. Spiegel, Advancing research and practice: the revised APA division 30 definition of hypnosis, Am. J. Clin. Hypn. 57 (4) (2015) 378–385.
[2] A. Vanhaudenhuyse, S. Laureys, M.-E. Faymonville, Neurophysiology of hypnosis, Neurophysiol. Clin. 44 (4) (2014) 343–353.
[3] C. Kendrick, J. Sliwinski, Y. Yu, A. Johnson, W. Fisher, Z. Kekecs, G. Elkins, Hypnosis for acute procedural pain: A critical review, Int. J. Clin. Exp. Hypn. 64 (1) (2016) 75–115.
[4] E.V. Lang, E.G. Benotsch, L.J. Fick, S. Lutgendorf, M.L. Berbaum, K.S. Berbaum, H. Logan, D. Spiegel, Adjunctive non-pharmacological analgesia for invasive medical procedures: a randomised trial, Lancet 355 (9214) (2000) 1486–1490.
[5] M.-C. Gay, Effectiveness of hypnosis in reducing mild essential hypertension: a one-year follow-up, Int. J. Clin. Exp. Hypn. 55 (1) (2007) 67–83.
[6] R. Garcia, C. Bouleti, A. Li, D. Frasca, S. El Harrouchi, J. Marechal, P. Roumegou, P. Corbi, L. Christiaens, F. Le Gal, B. Degand, Hypnosis versus placebo during atrial flutter ablation: The PAINLESS study: A randomized controlled trial, JACC Clin. Electrophysiol. 6 (12) (2020) 1551–1560.
[7] A. Forster, P. Bourgeois, The role of hypnosis in the treatment of burns, Rev. Med. Suisse Romande 107 (9) (1987) 731–734.
[8] C. Berry, S. Stewart, E.M. Payne, J.D. McArthur, J.J.V. McMurray, Electrical cardioversion for atrial fibrillation: outcomes in "real-life" clinical practice, Int. J. Cardiol. 81 (1) (2001) 29–35.
[9] F. Garden-Brèche, S. Desanneaux-Guillou, Hypnose Médicale En Situation Difficile: Retour D'expériences Conjuguées Pour Un Perfectionnement En Pratique Ericksonienne, Arnette, John Libbey Eurotext, Montrouge, France, 2014.
[10] V. Alaux-Dhenin, Une place pour l'Hypnose en Urgence Pré-Hospitalière, Etude auprès des médecins et infirmiers sapeurs-pompiers du Service de Santé et de Secours Médical du SDIS 06 et primo expérience personnelle, Université de Nice Sophia-Antipolis, 2018.
[11] R. Novoa, T. Hammonds, Clinical hypnosis for reduction of atrial fibrillation after coronary artery bypass graft surgery, Cleve Clin. J. Med. 75 (Suppl_2) (2008) S44–S47.
[12] D. Dobrev, M. Aguilar, J. Heijman, J.-B. Guichard, S. Nattel, Postoperative atrial fibrillation: mechanisms, manifestations and management, Nat. Rev. Cardiol. 16 (7) (2019) 417–436.
[13] M. Scaglione, A. Battaglia, P. Di Donna, M. Peyracchia, B. Bolzan, P. Mazzucchi, M. Muro, D. Caponi, Hypnotic communication for periprocedural analgesia during transcatheter ablation of atrial fibrillation, Int J Cardiol Heart Vasc 24 (2019) 100405, https://doi.org/10.1016/j.ijcha.2019.100405.
[14] M. Scaglione, A. Battaglia, A. Lamanna, N. Cerrato, P. Di Donna, E. Bertagnin, M. Muro, C. Alberto Caruzzo, M. Gagliardi, D. Caponi, Adjunctive hypnotic communication for analgosedation in subcutaneous implantable cardioverter defibrillator implantation. A prospective single center pilot study. International journal of cardiology, Heart & Vasculature 35 (2021), 100839–100839.
[15] D.H. Murman, A.J. McDonald, A.J. Pelletier, C.A. Camargo Jr., U.S. emergency department visits for supraventricular tachycardia, 1993-2003, Acad. Emerg. Med. 14 (6) (2007) 578–581.
[16] A. Fesas, E. Giannoula, A. Vrachimis, A. Doumas, C. Wenning, M. Didagelos, I. Iakovou, Cardiac Autonomic Nervous System and Ventricular Arrhythmias: The

Role of Radionuclide Molecular Imaging, Diagnostics (Basel) 11 (7) (2021) 1273, https://doi.org/10.3390/diagnostics11071273.
[17] S. Stavrakis, K. Kulkarni, J.P. Singh, D.G. Katritsis, A.A. Armoundas, Autonomic Modulation of Cardiac Arrhythmias: Methods to Assess Treatment and Outcomes, JACC Clin. Electrophysiol. 6 (5) (2020) 467–483.
[18] M.J. Shen, D.P. Zipes, Role of the autonomic nervous system in modulating cardiac arrhythmias, Circ. Res. 114 (6) (2014) 1004–1021.
[19] D.C. Hammond, Hypnosis in the treatment of anxiety- and stress-related disorders, Expert Rev. Neurother. 10 (2) (2010) 263–273.
[20] E. Boselli, H. Musellec, L. Martin, F. Bernard, N. Fusco, N. Guillou, P. Hugot, X. Paqueron, T. Yven, C. Virot, Effects of hypnosis on the relative parasympathetic tone assessed by ANI (Analgesia/Nociception Index) in healthy volunteers: a prospective observational study, J. Clin. Monit. Comput. 32 (3) (2018) 487–492.
[21] A.E. Aubert, B. Verheyden, F. Beckers, J. Tack, J. Vandenberghe, Cardiac autonomic regulation under hypnosis assessed by heart rate variability: spectral analysis and fractal complexity, Neuropsychobiology 60 (2) (2009) 104–112.
[22] H.-G. Kim, E.-J. Cheon, D.-S. Bai, Y.H. Lee, B.-H. Koo, Stress and heart rate variability: A meta-analysis and review of the literature, Psychiatry Investig. 15 (3) (2018) 235–245.
[23] P. Severino, M.V. Mariani, A. Maraone, A. Piro, A. Ceccacci, L. Tarsitani, V. Maestrini, M. Mancone, C. Lavalle, M. Pasquini, F. Fedele, Triggers for atrial fibrillation: the role of anxiety, Cardiol. Res. Pract. 2019 (2019) 1–5.
[24] E. Ruiz Vargas, P. Sörös, J.K. Shoemaker, V. Hachinski, Human cerebral circuitry related to cardiac control: A neuroimaging meta-analysis, Ann. Neurol. 79 (5) (2016) 709–716.
[25] H.A. Howard, Promoting safety in hypnosis: A clinical instrument for the assessment of alertness, Am. J. Clin. Hypn. 59 (4) (2017) 344–362.
[26] W. Häuser, M. Hagl, A. Schmierer, E. Hansen, The efficacy, safety and applications of medical hypnosis, Deutsches Arzteblatt Int. 113 (17) (2016) 289–296.
[27] J. Kittle, D. Spiegel, Hypnosis: the most effective treatment you have yet to prescribe, Am. J. Med. 134 (3) (2021) 304–305.

Amandine Berner
Division of General Internal Medicine, Geneva University Hospitals, Geneva, Switzerland

Caroline Tobler
Department of Pediatrics, Fribourg Hospital HFR, Fribourg, Switzerland

Marie Reinmann-Assouline, Sophie Degrauwe
Cardiology Division, Geneva University Hospitals, Geneva, Switzerland

Matteo Coen*
Division of General Internal Medicine, Geneva University Hospitals, Geneva, Switzerland
Unit of Development and Research in Medical Education (UDREM), Faculty of Medicine, University of Geneva, Geneva, Switzerland

* Corresponding author at: Division of General Internal Medicine, Geneva University Hospitals and Unit of Development and Research in Medical Education (UDREM), Faculty of Medicine, University of Geneva, Geneva, Switzerland.
E-mail address: matteo.coen@hcuge.ch (M. Coen).