National University of Medical Sciences (NUMSS)

Bachelor of Science in Osteopathy (BSc (Ost))

Thesis:

Osteopathic manual diaphragm treatment in hiatal hernia-related tachycardias: a case study

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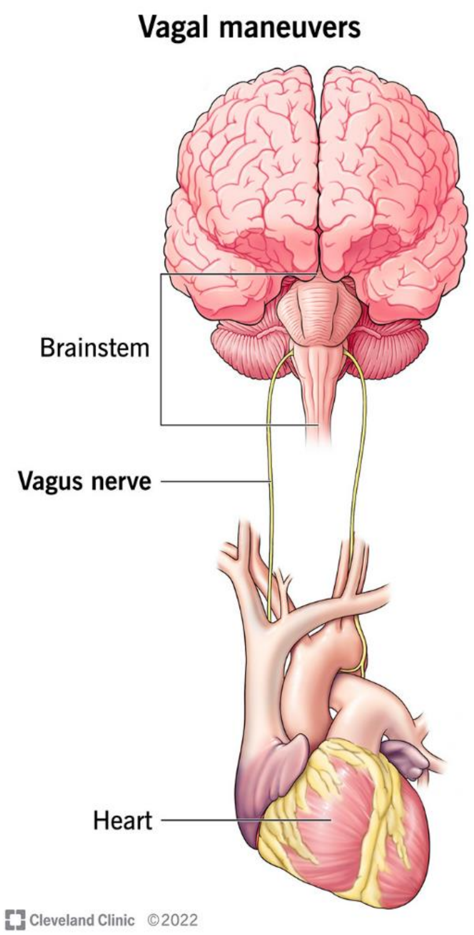
Introduction.

Tachycardia and tachyarrhythmias are common symptoms among patients presenting to emergency departments (EDs). While there is existing literature linking hiatal hernia (JH) to cardiac rhythm disturbances, our contribution specifically focuses on the potential correlation between JH and sinus tachycardia (ST).
The proposed mechanism underlying the association between hiatal hernia (JH) and sinus tachycardia (ST) involves two primary factors: Dynamic Cardiac Compression and Neuroreflex Mechanism with Autonomic Involvement These episodes of ST associated with JH are typically characterized by their transient and self-limiting nature. They are predominantly observed in emergency department (ED) settings, particularly within the European Union.
The coexistence of JH and ST warrants a high degree of clinical suspicion. Prompt recognition of these concomitant conditions is crucial for appropriate management and to rule out other potential underlying causes of ST.

At present, the therapeutic application of manual maneuvers in the management of tachycardia is primarily restricted to vagal maneuvers employed for supraventricular tachycardia (SVT). These maneuvers are implemented in accordance with the international guidelines established by the American Heart Association (1).

Vagal Maneuvers (VM) and SVT.

Vagal maneuvers are non-invasive techniques that aim to stimulate the vagus nerve by prompting it to act on the heart's natural pacemaker, slowing down its electrical impulses.. The vagus nerve extends from the brainstem to the abdomen, exerting significant influence over various bodily functions, incòuding regulating Heart Rate
Vagal maneuvers are employed in accordance with American Heart Association (AHA) guidelines for the treatment of supraventricular tachycardia (SVT) and they represent the first-line treatment (initial choice) for SVT (1)



To fully grasp the mechanism by which vagal maneuvers can effectively slow down or terminate an abnormally rapid heart rate, it is essential to first delve into the underlying pathophysiology of SVT.
SVT is a rapid heartbeat that originates in the chambers above the ventricles, It can occur due to a variety of reasons, such as structural abnormalities and heart failure
The effective management of supraventricular tachycardia (SVT) using vagal maneuvers hinges on a clear understanding of supraventricular arrhythmias and how increased myocardial refractoriness can effectively terminate these arrhythmias. (2)

Classifying SVT Based on Atrial Electrical Pathways as follow.

Atrioventricular Nodal Reentrant Tachycardia (AVNRT) : this is The Most Common Paroxysmal SVT (3). Individuals with atrioventricular nodal reentrant tachycardia (AVNRT) exhibit two distinct atrioventricular nodal inputs, each characterized by unique electrophysiological properties: the fast pathway and the slow one, form the two arms of the reentrant circuit. The fast pathway enters the AV node near the compact region; the slow pathway enters the AV node near the ostium of the coronary sinus

Atrioventricular Reentrant Tachycardia (AVRT):
AVNRT exhibits a distinct mechanism when accessory pathways, also known as Kent's bundles, are present. These accessory pathways traverse the atrioventricular septum and thus provide a larger reentrant circuit, despite passing through the AV node and being similarly affected by increased vagal tone. (4)
The vagus nerve supplies parasympathetic motor fibers to the myocardium. Vagus nerve stimulation (VNS) involves different techniques used to stimulate aortic baroreceptors located within the walls of the aortic arch and carotid bodies. These receptors trigger an increase in vagal tone, which in turn stimulates a bradycardia response at the level of the AV node. This prolongs refractoriness of the nodal tissue and disrupts the re-entry circuit (2).

Types of VM

Coughing: Coughing produces the same physiological response as the bearing down (Valsalva maneuver) (see below), but it may be easier to perform. The cough should be forceful and sustained (i.e., a single cough is unlikely to be effective in terminating an arrhythmia).

Cold Stimulus to the Face: This technique involves immersing a patient's face in ice-cold water. Alternative methods include applying an ice pack to the face or a washcloth soaked in ice water. The cold stimulus to the face should last about 10 seconds. This creates a physiological response similar to that which occurs when a person is immersed in cold water (Diver's Reflex).

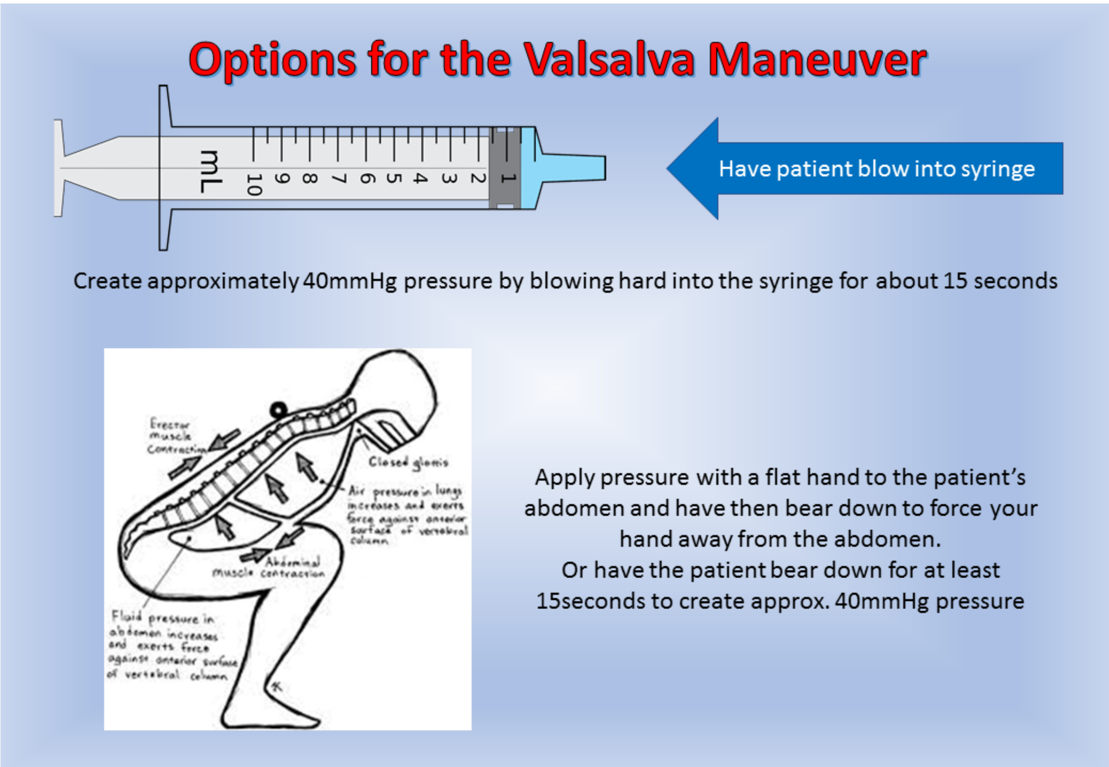
Carotid Massage: This technique is performed with the patient's neck in an extended position, the head turned away from the side being massaged. Only one side should be massaged at a time.
Pressure is applied under the angle of the jaw in a gentle circular motion for about 10 seconds.
The patient should be monitored throughout. Note that this technique is not recommended for everyone. Patients with carotid artery stenosis and a history of smoking may not be good candidates for this procedure.

Gagging Gagging can stop an episode of supraventricular tachycardia (SVT) by stimulating the vagus nerve. A tongue depressor is briefly inserted into the patient's mouth, touching the back of the throat, which causes the person to reflexively gag. The gag reflex stimulates the vagus nerve.

Bearing Down: Medically known to as the Valsalva Maneuver, this technique is one of the most common ways to stimulate the vagus nerve. The patient is instructed to bear down forcefully, as if straining to have a bowel movement. Essentially, the patient is attempting to exhale against a closed glottis .

An alternative method for performing the Valsalva Maneuver is to instruct the patient to blow forcefully into a straw or the barrel of a 10 ml syringe while occluding the opposite end. This maneuver should last for 15-20 seconds.

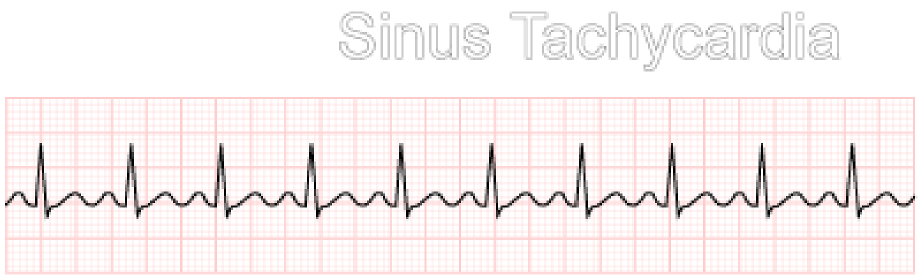
Both techniques increase intrathoracic pressure and stimulate the vagus nerve.



Research Focus: Sinus tachycardia (ST)

Sinus tachycardia is defined as a heart rate greater than 100 beats per minute
The trace shows P waves, indicating a sinus rhythm originating from the sinoatrial node (SA node).
Sinus tachycardia typically does not exceed 120-130 beats per minute and has a gradual onset and termination. Reentry SVT has an abrupt onset and termination. Sinus tachycardia is excluded by the ACLS AHA adult pulse tachycardia algorithm. In fact, sinus tachycardia is caused by non-cardiac factors, such as fever, anemia, hypotension, bleeding, or physical exercise (systemic, non-cardiac conditions).
ST is a regular rhythm. Although the heart rate can be slowed by vagal maneuvers, these maneuvers are generally not indicated in AHA guidelines.

Our research aims to investigate the potential correlations between sinus tachycardia and hiatal hernia, and subsequently propose a manual osteopathic treatment approach.



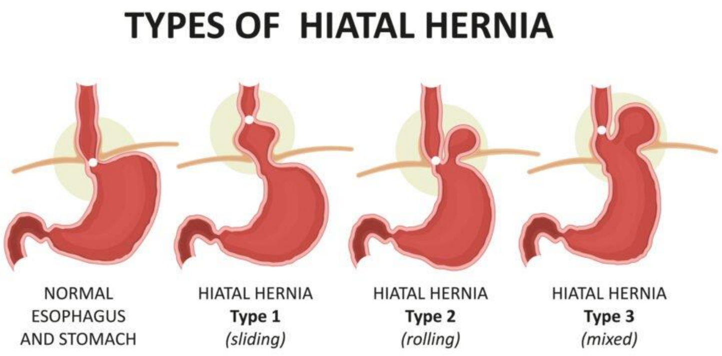
The possible role of hiatal hernia (HH) and gastroesophageal reflux in determining tachycardia and tachyarrhythmias.

A hiatal hernia occurs when the upper part of the stomach bulges through an opening in the diaphragm upward into the chest cavity. It is more common than you might think. Analysis of 1260 patients who underwent EGD showed that 333 patients had hiatal hernia on endoscopy (26%). Analysis of the patients, when subdivided into age groups, showed a consistent upward trend in hiatal hernia prevalence with increasing age. Over age 80 prevalence is more than 42%. There is a significant linear association between increasing age and prevalence of hiatal hernia with no threshold effect. (5)

Hiatal hernias can cause a variety of symptoms: heartburn , difficulty swallowing, shortness of breath, chest pain, and tachycardia (especially sinus tachycardia) are the most common.

While surgery is sometimes necessary, non-invasive methods like Visceral Manipulation can be an effective conservative treatment option.

There are different types of hiatal hernia (HH)



Evidence from the literature.

Until a few years ago, the correlations between sinus tachycardia, extrasystole, and gastrointestinal disorders, such as hiatal hernia, were almost always dismissed by cardiologists due to a lack of scientific evidence. This has changed in recent years with the publication of several scientific studies.

A 2009 review on cardiac manifestations and sequelae of gastrointestinal disorders provides some examples of rhythm disturbances associated with esophageal disease (6).

Deglutition syncope is recognized as a neurally mediated syncopal syndrome characterized by inappropriate bradycardia that causes loss of consciousness during swallowing. Distension of the esophagus with a balloon can provoke the arrhythmia, which can be abolished by atropine.
Swallowing syncope has been successfully treated with both anticholinergic drugs and partial esophageal denervation, as well as with demand pacing. Consequently, the mechanism behind swallowing syncope was thought to be the result of hypersensitive mechanical receptors in the esophagus triggering an autonomic vasovagal reflex resulting in a parasympathetically mediated negative chronotropic effect.

Tachyarrhythmias: The mechanism underlying swallowing-induced tachyarrhythmias is less clear, with ongoing debate surrounding its electrophysiological basis. In some cases, the tachyarrhythmia has been demonstrated to be triggered by paced atrial ectopic beats, suggesting that atrial ectopics can initiate atrioventricular (AV) re-entry tachycardias. However, in most instances, since the tachycardia persists even in the presence of AV block, enhanced automaticity is thought to be the underlying mechanism of the arrhythmia.

Equally difficult to elucidate is the trigger for the afferent loop of the reflex leading to the tachycardia. One proposed mechanism is that of direct mechanical stimulation of the left atrium by the distended esophagus on swallowing a bolus of food. This is supported by the observation that in these patients, inflation of a balloon in the esophagus at the level of the left atrium leads to tachyarrhythmias that disappear on deflation. However, this concept is contradicted by evidence suggesting that balloon inflation away from the level of the heart can also trigger abnormal rhythms.

As evidenced by all studies on deglutition arrhythmias, the precise pathogenesis and etiology have yet to be determined, although autonomic reflexes appear to be involved
There is no established therapy for deglutition tachyarrhythmias. Surgical repositioning of the esophagus has terminated these arrhythmias experimentally, but this could be due either to relief from the mechanical stimulation of the left atrium by the esophagus, or from surgical cardiac denervation (7).

Anecdotally, many clinicians have reported a marked reduction in rhythm disturbances with the introduction of proton-pump inhibitors in these patients. This is a therapeutic option that I personally use in the emergency department as well, but one that requires formal investigation (Figure 1)

Figure 1. ECG recording from a 60 year old man who experienced palpitations after eating. He developed atrial fibrillation after eating a biscuit. He was found to have reflux oesophagitis and no cardiac abnormality. Treatment with the proton pump inhibitor omeprazole solved the problem.

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More recent scientific publications have provided further evidence in support of the link between hiatal hernia and the onset of tachyarrhythmias.

Most patients report cardiac abnormalities associated with HH that include atrial fibrillation, atrial flutter, supraventricular tachycardia, and bradycardia. A recent publication presents a rare case of a large HH causing frequent premature ventricular contractions (PVCs) in bigeminy form that resolved with surgical correction of HH and did not recur on subsequent Holter monitoring. (8)

PVCs are ventricular ectopic beats which lead to direct depolarization of the ventricles bypassing the His-Purkinje system, leading to asynchronous activation of the two ventricles. ECG prevalence of PVCs is reported to be around 1–4%. PVCs are mostly asymptomatic, but can result in palpitation, shortness of breath, fatigue, or presyncope. Although the cause of PVCs remains largely unknown, some of the potential mechanisms for PVCs include triggered activity, automaticity and reentry. Several arrhythmias triggered by a large HH have been described in the literature. The most frequently reported arrhythmia associated with HH is atrial fibrillation (AFib). A retrospective study by Roy et al. reported that 7.1% of all patients with HH also experienced AFib. The prevalence of AFib was 17.5 times and 19 times higher in men and women younger than 55 years with HH compared to the general population (9).

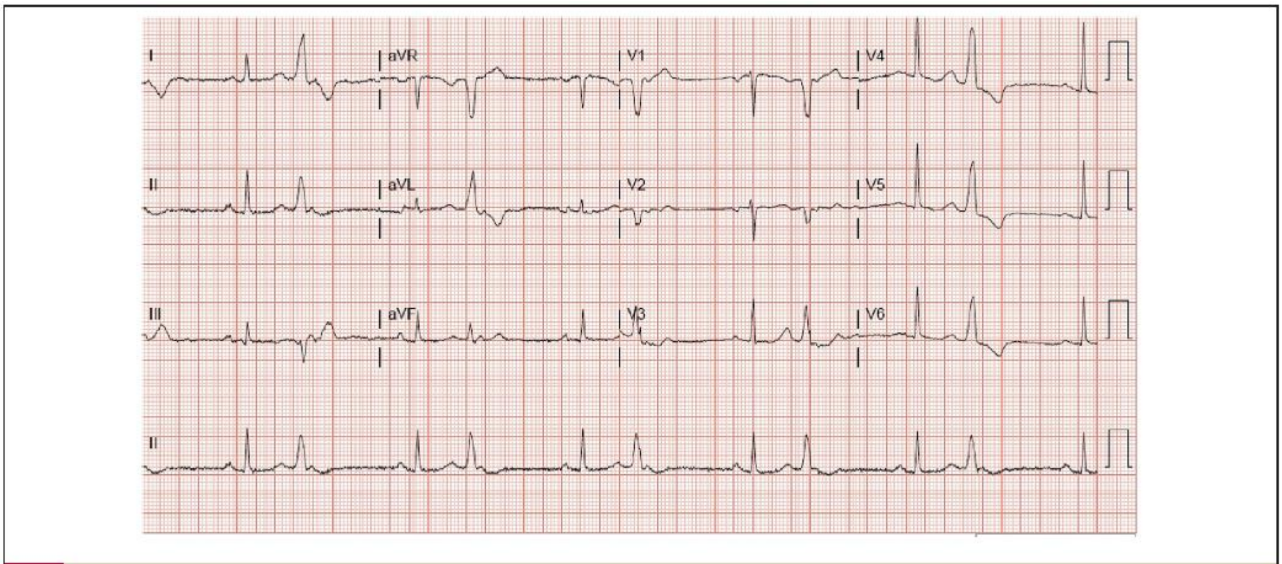


Fig. 1. EKG at the time of presentation to the ED showing bigeminy.

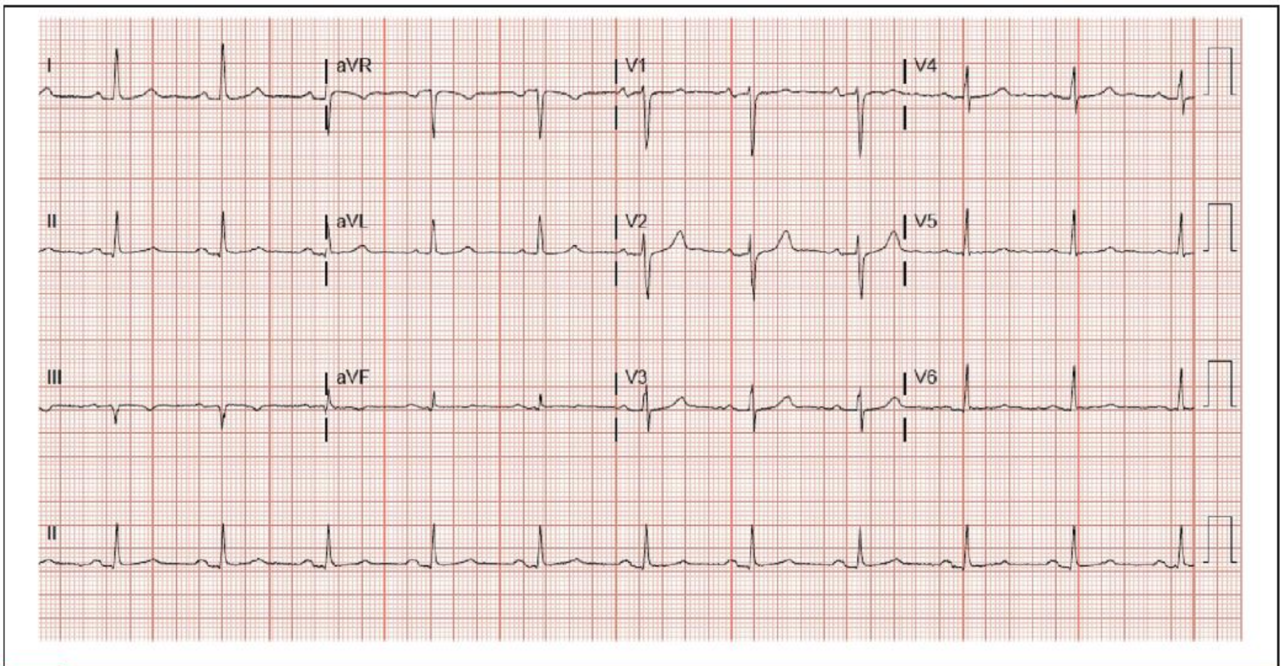


Fig. 3. EKG taken a day after the hernia repair surgery showing resolution of bigeminy.

The exact mechanism for the association between tachyarrhythmias and HH is unclear. Some of the hypotheses that have been postulated to explain the association of HH with cardiac arrhythmias include:

1. HH-associated reflux esophagitis and inflammation can extend to surrounding structures including the left atrium and lead to tachyarrhythmias due to mechanical or chemical/neural impact mediated through the vagal or sympathetic nervous system (10).

2. Persistent compression of the left atrium by HH can result in an area of relative ischemia and conduction block causing reentry (11).

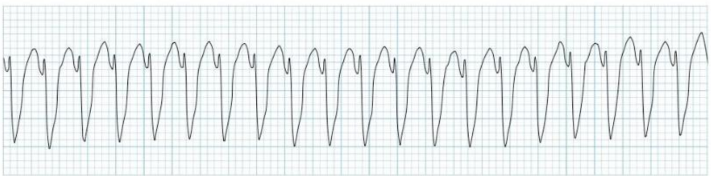
3. Stimulation of the vagus nerve due to compression from HH and increased vagal tone leading to tachycardia onset (12).

4. Mechanical contact and irritation of the left atrium or pulmonary veins by the HH leading to ectopic causing AFIb (13)

5. Torsion or compression of the epicardial artery from direct pressure by the HH leading to ST elevation (14).

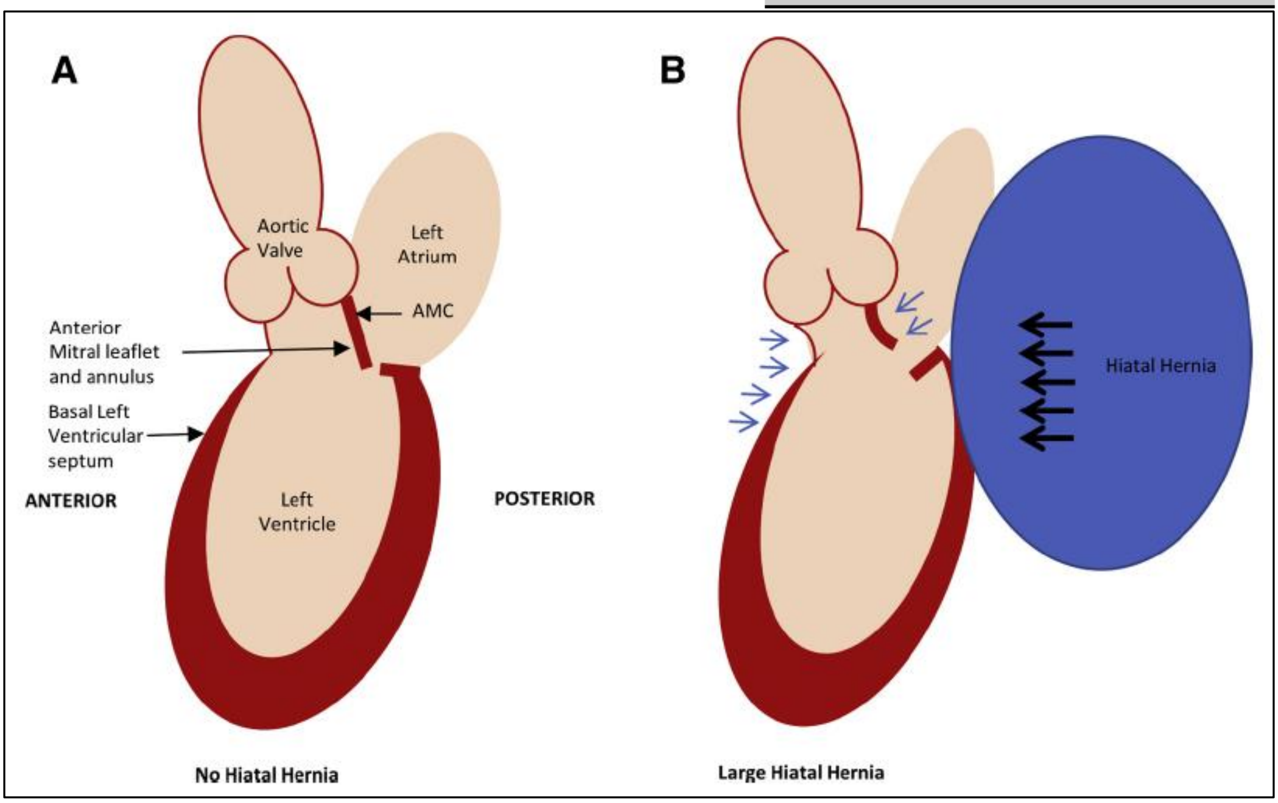
Posterior cardiac compression from hiatal hernia : a patential cause of ventricular tachycardia (VT)

Large hiatal hernia (HH) can cause extensive posterior cardiac compression, including frequent compression of the basal inferior left ventricular (LV) wall, with such changes resolving post HH repair. It can cause not only tachyarrhythmias but also the more dangerous VT (15)



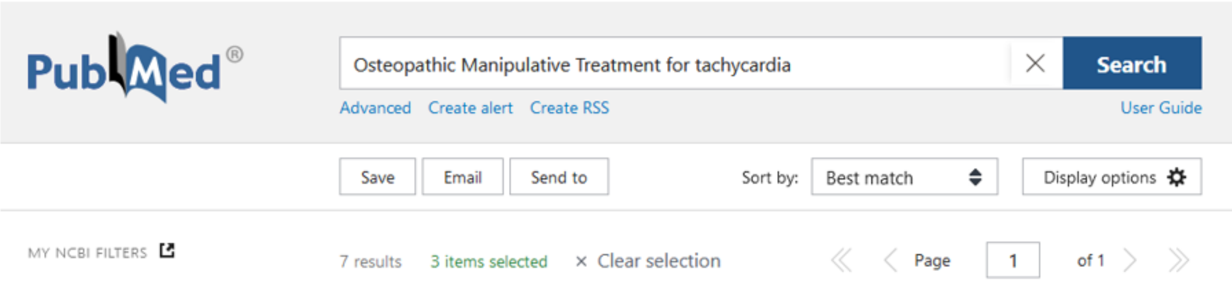
KEY TEACHING POINTS

- Large hiatal hernia can cause extensive posterior cardiac compression including frequent compression of the basal inferior left ventricular wall, with such changes resolving post hernia repair.
- The implications of hiatal hernia–induced cardiac distortion on arrhythmia pathogenesis are poorly recognized.
- Atrial arrhythmias have been described, which are likely attributable to left atrial compression.
- Hiatal hernia–induced posterior cardiac compression and associated mitral annular region distortion seems to have caused a propensity to frequent symptomatic ventricular tachycardia (VT) in our case, with postoperative resolution of compression correlating with VT resolution.
- Early recognition of this association with arrhythmogenesis is imperative, as hiatal hernia may be a treatable cause of such arrhythmias.



What data is available in the literature regarding therapeutic treatment for tachycardias and tachyarrhythmias?

A search on PubMed reveals few studies that meet the search criteria. Essentially, there are no studies that support a direct link between osteopathic treatment and arrhythmia therapy



Goodkin MB, Bellew LJ. Osteopathic manipulative treatment for postural orthostatic tachycardia syndrome. J Am Osteopath Assoc. 2014 Nov;114(11):874-7. doi: 10.7556/jaoa.2014.173. PMID: 25352409.

Tafler L, Chaudry A, Cho H, Garcia A. Management of Post-Viral Postural Orthostatic Tachycardia Syndrome With Craniosacral Therapy. Cureus. 2023 Feb 15;15(2):e35009. doi: 10.7759/cureus.35009. PMID: 36938206; PMCID: PMC10021347.

Julian MR. Treatment of paroxysmal supraventricular tachycardia using instrument-assisted manipulation of the fourth rib: a 6-year case study. J Manipulative Physiol Ther. 2008 Jun;31(5):389-91. doi: 10.1016/j.jmpt.2008.04.004. PMID: 18558281.

However, things change when we shift our focus to the osteopathic treatment of gastrointestinal pathologies: specifically, gastroesophageal reflux disease and HH.

Based on the premises discussed so far, it is reasonable to assume that treating these pathologies with osteopathic techniques can lead to an improvement not only of the pathologies themselves but also of the consequences they cause. Among these, particularly those affecting heart rhythm.

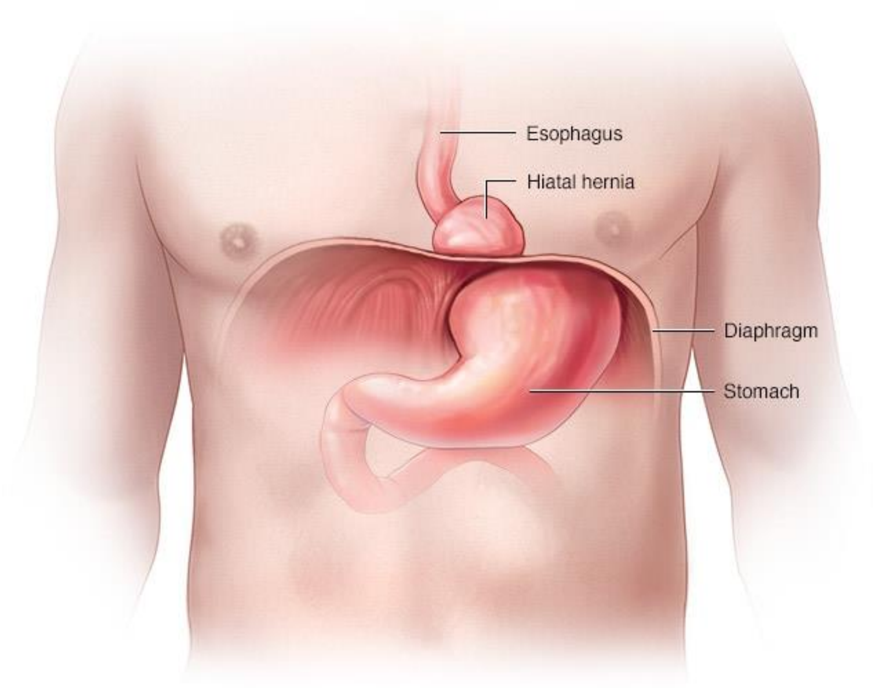
Hiatal Hernia treatment with Osteopathic Manipulative Tecniques.

As we mentioned earlier, while surgery may be necessary in some cases, non-invasive methods like Visceral Manipulation can be an effective conservative treatment option.

Visceral Manipulation is an osteopathic manual therapy modality that utilizes gentle, specifically directed pressure on the soft tissues of the thorax, abdomen, and pelvis to enhance the mechanical balance and function of the internal organ systems. This therapy can aid in alleviating pain and improving the mobility of organs like the stomach, liver, and intestines

When it comes to treating hiatal hernia, Visceral Manipulation can be particularly effective because it focuses on the diaphragm, the primary muscle involved in breathing. The diaphragm separates the chest cavity from the abdominal cavity, but it has several small openings in it to allow tube-like structures, such as the aorta blood vessel or the esophagus, to pass through. Since the esophagus penetrates the diaphragm to meet the stomach in the abdominal cavity below, the mechanical relationship between these structures is very important.

The tension between the diaphragm, esophagus, and stomach must be balanced to keep these structures in their proper place. When this balance is disrupted, a part of the stomach can push upward from the abdomen through the esophageal opening in the diaphragm. This occurs partly because the pressure in the abdomen is higher than in the thorax (chest cavity). When the esophagus is not centered in its diaphragmatic opening and does not "plug the hole," the pressure difference pushes the upper part of the stomach out of the abdominal cavity and into the chest cavity. (16)



Osteopathic treatment, evidence from literature.

We found three good scientific works that illustrate the principles of osteopathic treatment in the case of gastroesophageal reflux and HH.

The first work refers to the clinical case of a patient with documented HH. (17)

A 71-year-old female patient presented with a 3 cm hiatal hernia diagnosed via esophagogastroduodenoscopy (EGD). The treatment did not require surgery. Instead, osteopathic manipulative treatment (OMT) was used to restore the functionality of the gastrointestinal tract and the position of the gastroesophageal junction. The patient had no significant past medical or surgical history and no contraindications to receiving osteopathic manipulative treatment (OMT).

The patient's symptoms were found to have improved after the application of OMT alone, with no symptoms of hiatal hernia and resolution of her somatic dysfunctions

She was treated with OMT using balanced ligamentous treatment (BLT), cranial OMT, muscle energy, and myofascial release to reduce the severity of somatic dysfunctions, restore normal anatomy and functioning to the affected regions. She tolerated the treatment well with no complaints.

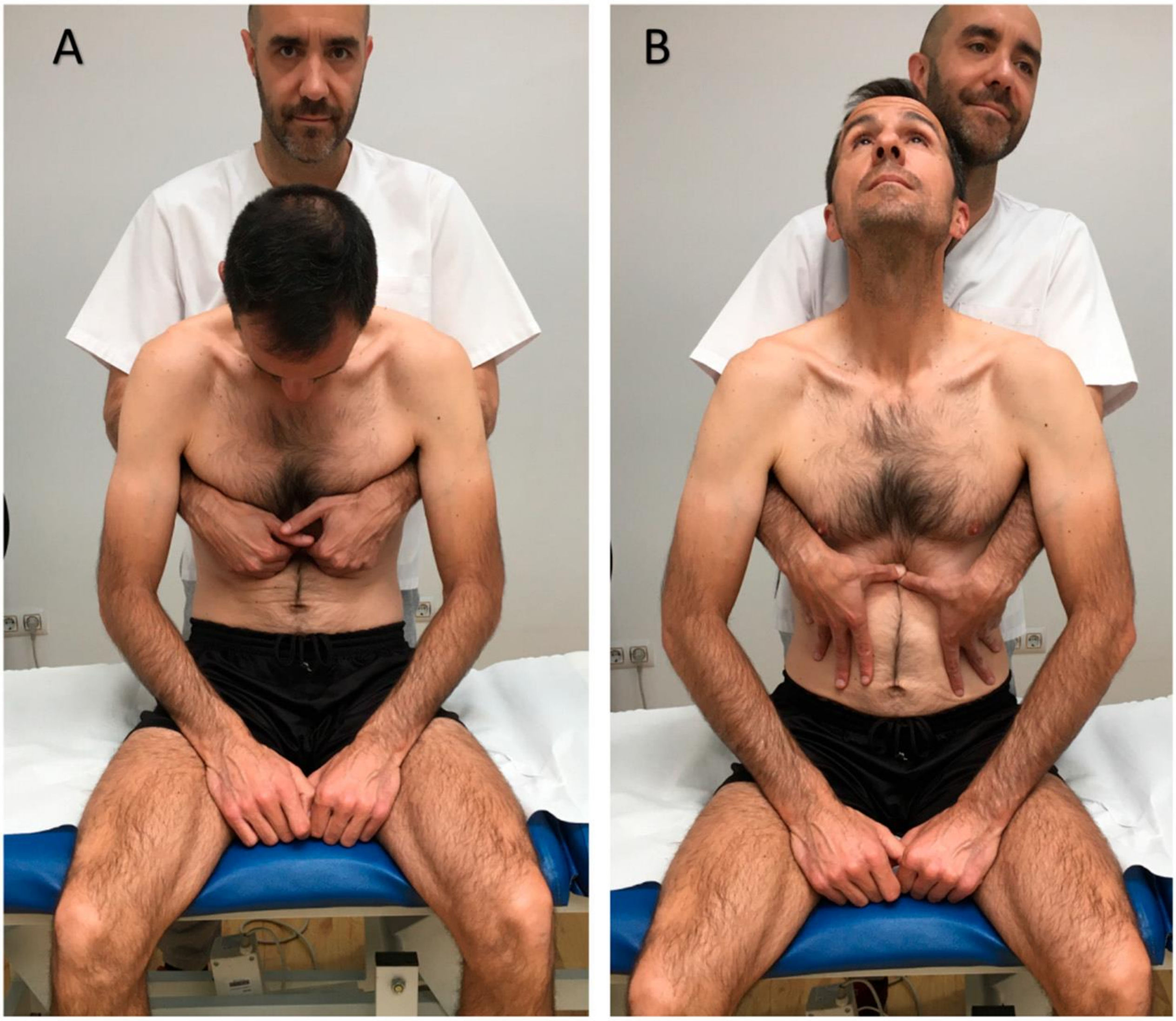
The study focuses on the application of BLT, osteopathic cranial manipulative medicine, muscle energy, and myofascial release. These techniques allow for the inhibition of an overstimulated vagus nerve and the correction of somatic dysfunctions of the diaphragm. As previously discussed, the vagus nerve carries mainly parasympathetic fibers with both sensory and motor functions, and it also plays an important role in cardiac function.

The second study we selected is a randomized trial with a good sample size (60 patients in total). It aims to investigate the effectiveness of osteopathic treatment for gastroesophageal reflux disease (GERD), also assessing its correlation with cervical pain. (18)

Clinical observations suggest a possible link between GERD, cervical pain, dystonia, and tightness through viscerosomatic reflexes triggered by activation and sensitization of the phrenic nerve. (19)

The aim of this study was to analyze GerdQ Test changes in GERD patients after osteopathic visceral treatment, and to evaluate its effects on C4 spinous process sensitivity and cervical range of motion. The patients were divided into two groups and subjected to an osteopathic treatment and a sham one

The experimental group (EG) underwent a visceral osteopathic technique, commonly used for GERD (20). To perform the technique, the patient was seated, and the osteopath positioned themselves behind, with their hands placed on the patient's epigastric area. The patient was then asked to flex their trunk while inhaling, allowing the osteopath to deepen their hands slightly on the epigastrium. Subsequently, the patient was asked to fully extend their spine and neck while exhaling, and at that time the osteopath applied caudal pressure with their hands. The procedure was repeated for 5 minutes.



Osteopathic manual technique for the lower esophageal sphincter.

A. Initial position. **B** Final position.

Primary Outcome: GERDQ Test. Secondary Outcomes: PPT (pressure pain threshold) and Cervical Mobility.

The GerdQ test scores decreased in the experimental group (EG) compared to the control group . The application of the osteopathic manual treatment in subjects with GERD produced a significant improvement in symptoms one week after the intervention, compared to the application of the sham maneuver. Cervical mobility increased in the EG compared to the CG, with a significant time-by-group interaction effect.
We can say that this study provides practical elements and strong evidence for the application of OMT for the treatment of GERD. (21)
In this single-blinded prospective study, an OMT protocol focusing on the diaphragm and esophagus was applied to a single patient who had been diagnosed with GERD 4 years prior. Outcomes were measured using the QS-GERD questionnaire. The OMT protocol was applied in 3 sessions (initial session, second session 1 week after the first and third session 2 weeks after the second).

Manual therapy techniques such as high-velocity, low-amplitude maneuvers and spinal mobilizations have received much attention in the literature. The same cannot be said for visceral manipulation because there is a lack of published research on the topic and because the current model of visceral manipulation is mostly drawn from textbooks and clinical experience. (22)

Unfortunately, as stated by Steele et al, several issues compromise the efficacy of OMT studies, such as subject recruitment and retention. Even the use of standardized protocols is subject to variations among practitioners. In addition, OMT application cannot always be quantified, especially when treating visceral dysfunctions. (23)
Also in this work, as in the previous one, the emphasis is placed on the correlation with the cervical spine.
In fact, the treated subject presented a C4 dysfunction and a group dysfunction at the T1-T4 level.
The authors use a protocol based on the textbooks of Quef (24) and Camirand (25)."
The protocol was executed in 3 sessions and consisted of 4 techniques: hiatal hernia reduction, pillars of the diaphragm normalization, sphincter normalization by recoil, and balancing of the diaphragms.

Hiatal Hernia Reduction

The objective of hiatal hernia reduction is to reduce the spasm of the smooth muscle at the EGJ. The patient is seated on the examination table with the thoracic spine in a slightly kyphotic position. The practitioner stands behind the patient. The practitioner passes his arms under the patient's armpits and supports the patient's back with his sternum at the height of thoracic vertebrae T4 through T8. The practitioner places the tips of his second through fourth fingers of both hands on the epigastric zone, pointing up and to the left. When the patient exhales, the practitioner exerts a force toward the left iliac fossa on the tissues under his fingers and asks the patient to straighten his back and to keep his head flexed while the practitioner increases the support of his sternum against the patient's back. During the patient's inspiration, the practitioner slightly relaxes his pressure and resumes the maneuver in the following expiration (Figure below). The technique was applied 3 or 4 times.

Hiatal hernia reduction technique. (A) The practitioner places the tips of his second through fourth fingers of both hands at the epigastric zone, pointing up and to the left. (B) When the patient exhales, the practitioner exerts a force toward the left iliac fossa on the tissues under his fingers and asks the patient to straighten his back and to keep his head flexed while the practitioner increases the support of his sternum against the patient's back. During the patient's inspiration, the practitioner slightly relaxes his pressure and resumes the maneuver in the following expiration.

Pillars of the Diaphragm Normalization

The objective of the pillars of the diaphragm normalization technique is to relax the tension of the pillars of the diaphragm. The patient is in a supine position with the lower limbs flexed (to relax the abdominal wall and to facilitate the maneuver). One hand of the practitioner is positioned posteriorly and perpendicular to the axis of the spine, with the fingers hooking the spinous processes (index finger on thoracic vertebra T12) and the lumbar vertebrae (middle finger in L1, ring finger in L2, and little finger in L3). The other hand approaches the costal arch with the fingers pointing laterally and the thumb reaching the diaphragmatic dome (under the costal arch). The anteriorly placed hand takes the costal arch laterally while the thumb deepens beneath the arch, putting the diaphragmatic dome in tension. The other hand stabilizes the spinous processes so they do not rotate. The practitioner holds the tension until he feels a release of the tissues.

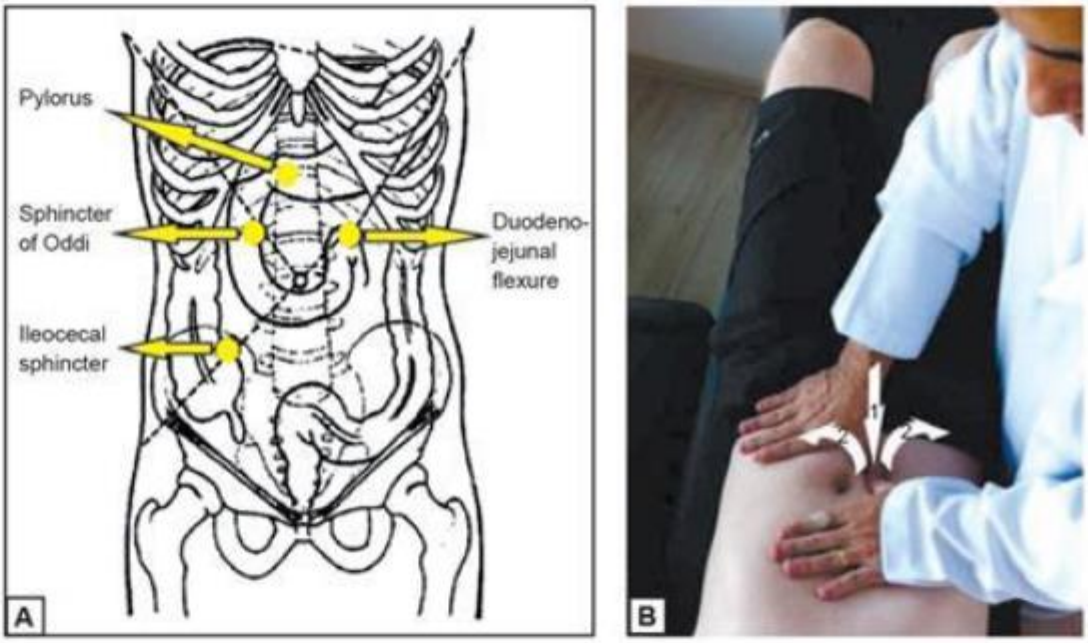
Pillars of the diaphragm normalization technique.

One hand of the practitioner is positioned posteriorly and perpendicular to the axis of the spine. The fingers of this hand hook onto the spinous processes of the lumbar vertebrae. The other hand approaches the costal arch with the fingers pointing laterally. The thumb of this hand reaches the diaphragmatic dome. The anteriorly placed hand grasps the costal arch laterally, while its thumb deepens beneath the arch to tension the diaphragmatic dome. The other hand stabilizes the spinous processes to prevent rotation. The practitioner maintains the tension until perceiving a release in the tissues.

Sphincter Normalization by Recoil

The objective of the sphincter normalization by recoil technique is to relax the smooth muscle tone of the following sphincters or sphincter-like structures: the ileocecal valve, the duodenojejunal junction, the sphincter of Oddi, and the pylorus.

The patient is positioned supine, with knees flexed and arms resting alongside the body. The practitioner stands on the patient's right side, facing the area to be treated. With thumbs stacked, the practitioner applies progressively posterior pressure on the targeted area during the patient's expiration. Once the limit of the zone's distensibility is reached, the practitioner maintains a light pressure followed by a rapid release. (See figure below). The duration of the technique varies depending on the tissues' distensibility.



Sphincter normalization by recoil technique.
(A) Location of Sphincters.
(B) Technique Application

The practitioner positions their thumbs stacked over the targeted area and applies progressively posterior pressure during the patient's expiration. Once the limit of the zone's distensibility is reached, the practitioner maintains a light pressure followed by a rapid release.

Balancing of Diaphragms

The objective of the balancing of diaphragms technique is to restore the fluidic and harmonic function between the diaphragms. The patient is in the supine position, and the upper and lower limbs are relaxed. The practitioner sits next to the patient. In procedure 1, the pelvic diaphragm, une hand is under the sacrum and the other hand is just above the pubic bone; in procedure 2, the thoracoabdominal diaphragm, one hand is under the vertebrae T12 through L2 zone, and the other hand is on the epigastric area; in procedure 3, the cervicothoracic diaphragm, one hand is under vertebrae T1 through T3 and the other hand is on the manubrium. For each of the 3 diaphragms, the practitioner perceives the tissues and, if necessary, induces the normalization according to the tissue's motility.

The perception of tissue normalization could be felt like a loosening of the tissues or a movement synchronization between the hands, but that is personal perception of the technique; it might vary among practitioners on the basis of the practitioner's experience and sensibility.

These tecniques are well defined also in Bordoni’s Work. (26)

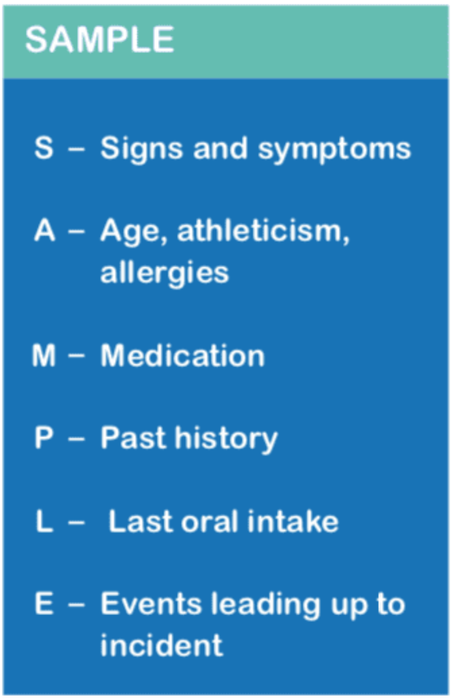
Our work: The OMT of the diaphragm in a case of sinus tachycardia in the emergency department.

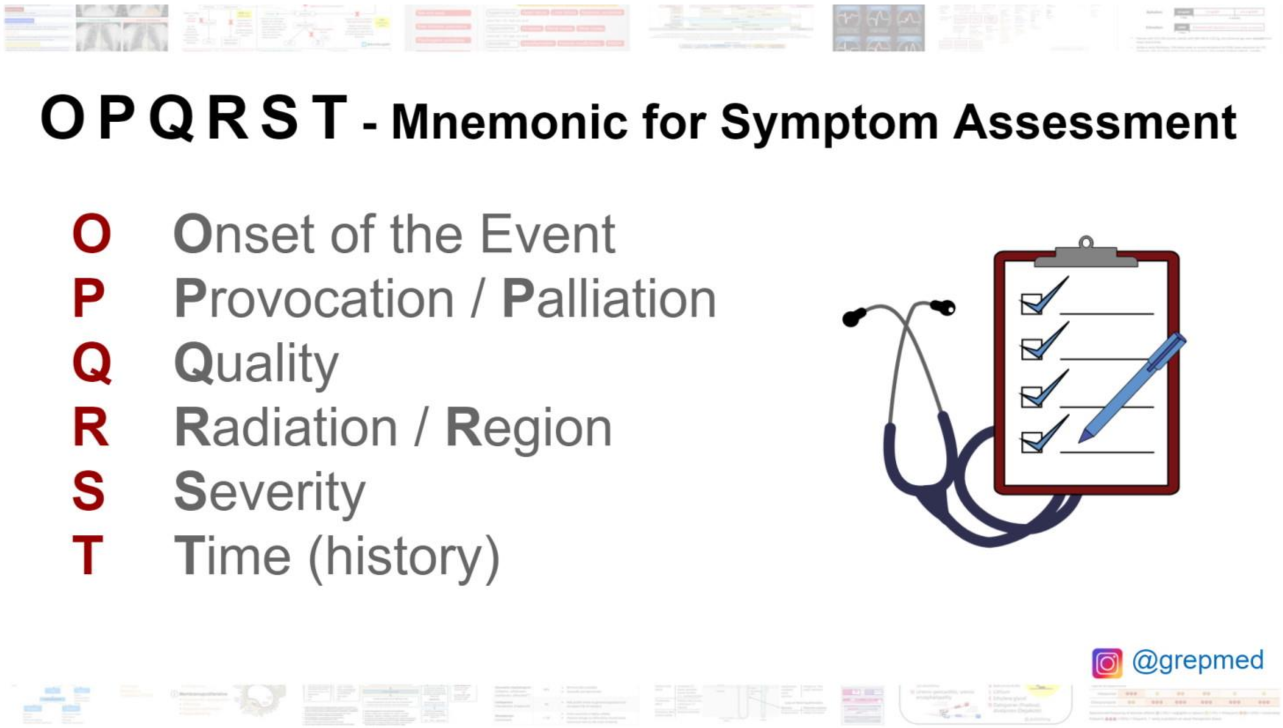
Building on the physiological and pathophysiological principles discussed previously, this study proposes an indirect treatment approach for sinus tachycardia. The approach utilizes diaphragmatic manipulation and reduction of a hiatal hernia, a condition the patient suffers from. In this case, the tachycardia appeared to be a secondary consequence of the underlying hiatal hernia (HH). By addressing the primary dysfunction (HH) through osteopathic techniques, the patient's clinical condition improved. Therefore, this work supports the effectiveness of the presented techniques in treating sinus tachycardia associated with hiatal hernia.

This report describes a 63-year-old woman presenting to the emergency department (ED) with palpitations and a heart rate (HR) between 120 and 130 beats per minute (bpm). Following a primary evaluation and electrocardiogram (ECG) confirming sinus tachycardia (TS), a secondary evaluation using the SAMPLE and OPQRST methods revealed: Comorbidity for esophagogastric junction (EGJ) outlet dysfunction, Recurrent episodes of heart palpitations , Negative results from elective cardiological testing, postural correlation of TS onset (increased heart rate with torso flexion and increased intra-abdominal pressure) and postprandial phase

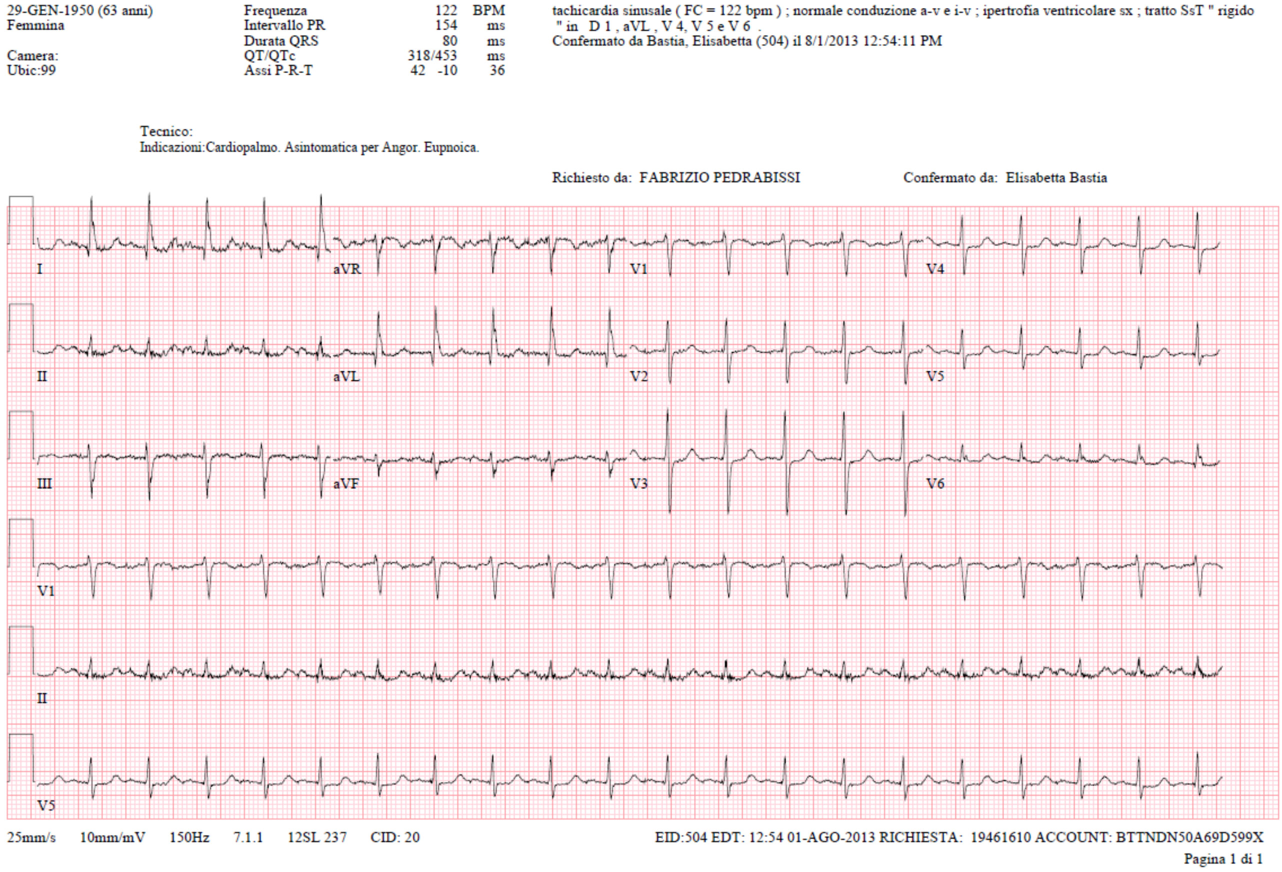
Therefore, under ECG monitoring, we implemented manual therapy to address the diaphragm and EGJ. This treatment included manual maneuvers applied directly to the diaphragm and stomach muscles. and postural maneuvers creating an anteroposterior stretch on the diaphragm.

The goal of these techniques was to target the primary area of muscular tightness. By promoting relaxation and unloading of overstressed postural muscles, these maneuvers ultimately facilitated diaphragmatic release. This release was crucial for achieving the primary objective: reduction of EGJ outlet dysfunction and subsequent decrease in sinus tachycardia.





First electrocardiographic evaluation

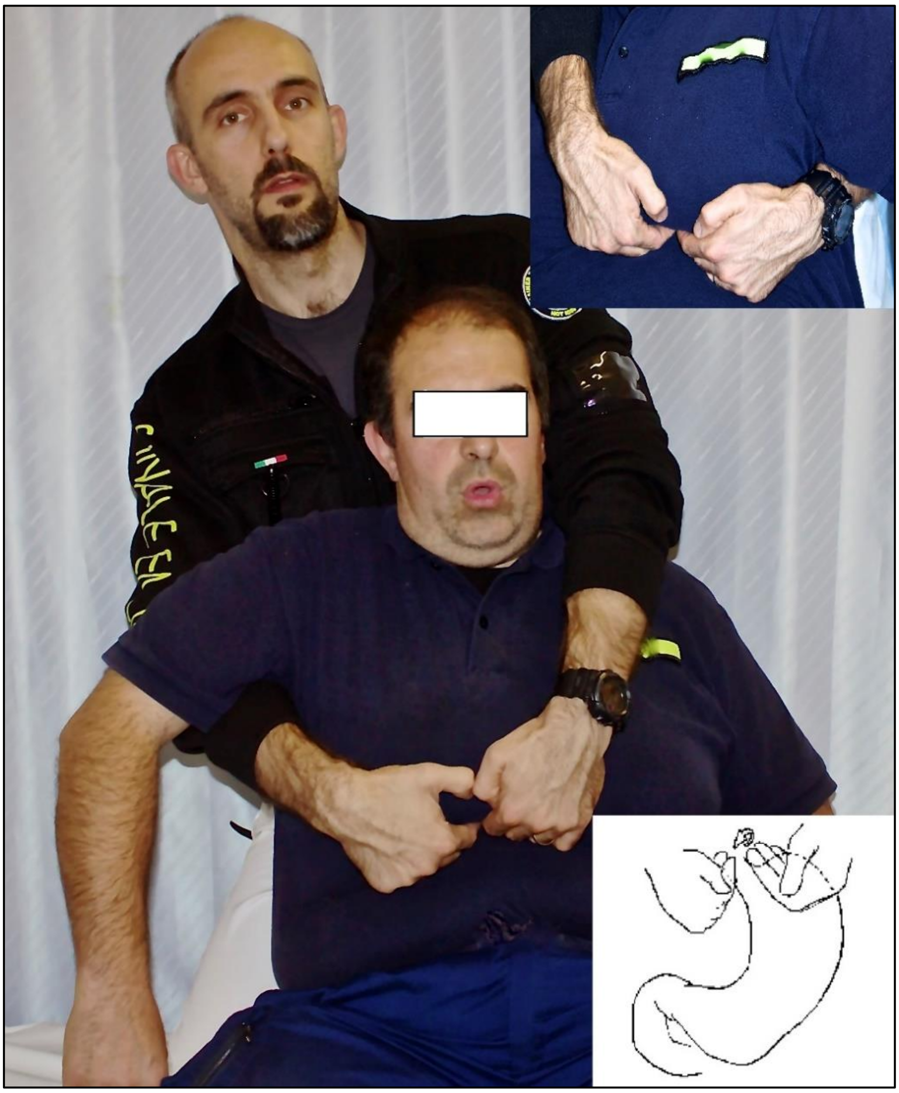


Methods and Tecniques.

Treatment consisted of two techniques:

Hiatal Hernia Reduction: This technique directly addresses the diaphragm, as described by the authors of the previously reported study and following Barral's guidelines. It is a simple and quick procedure performed with the patient in a seated position, continuously monitored by ECG. The typical duration ranges from 2 to 5 minutes.

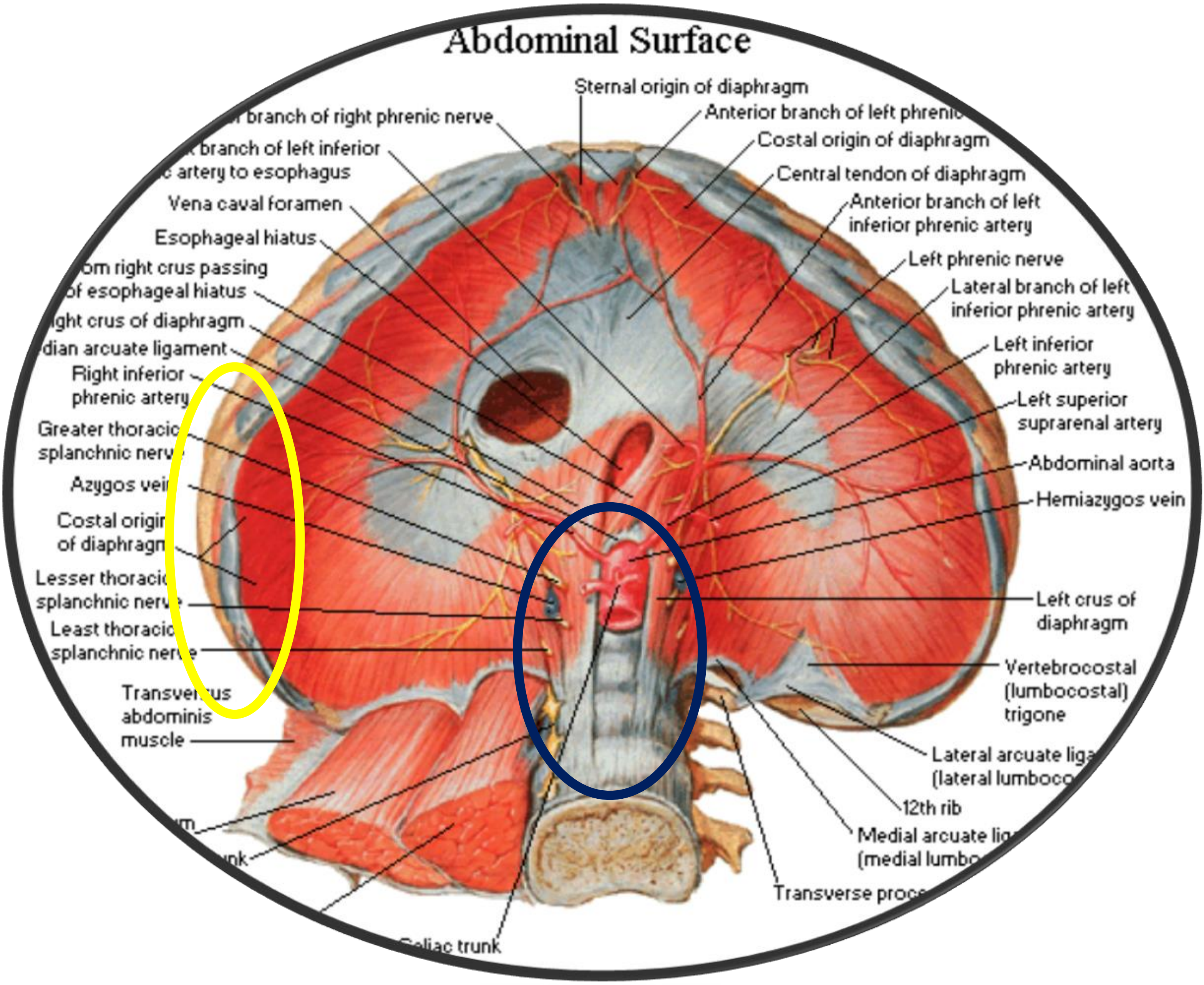
As an illustrative example, we include a figure demonstrating the maneuver subsequently performed on a volunteer.



The maneuver began with a contact at the hypogastric level and then moved laterally towards the left hypochondriac region. During the technique, we maintained support on the patient's back at the level of the sternum and hypogastrium, corresponding to thoracic vertebrae T4 to T8.
In this technique, during exhalation, the practitioner applies a posterosuperior-leftward force on the tissues under their fingers. The patient is instructed to straighten their back while maintaining neck flexion as the practitioner increases sternal support against the patient's back. During inhalation, the practitioner slightly reduces pressure and repeats the maneuver on the next exhalation.

The maneuver begins by addressing the right hemidiaphragm and then progresses to focus on the left side.
This is followed by a second technique targeting the diaphragmatic pillars.

As it doesn't directly manipulate the hiatal opening, this second technique can be considered indirect



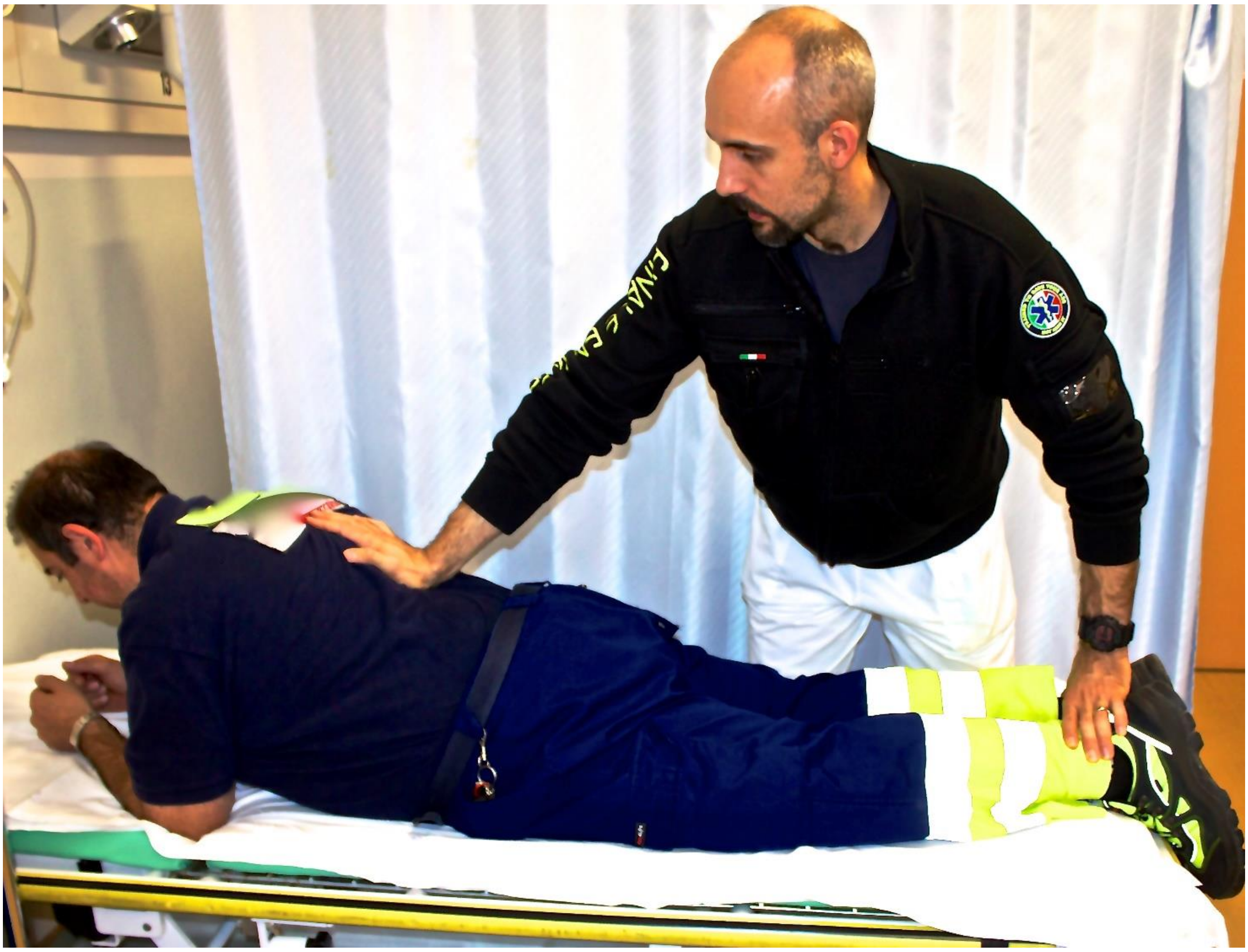
The techniques applied act on the diaphragmatic costal part and on the pillars. The first directly, with a contact, the second indirectly. As can be easily understood from the anatomy of the district.

Unlike the previously described technique, the second technique is not documented in the referenced literature. It originates from the teachings of the French School of Osteopathy in Bobigny. This approach offers greater patient comfort by avoiding direct contact in the epigastric region. However, it may require more skill and effort from the practitioner to perform effectively.

During this technique the patient is instructed to breathe slowly. The practitioner's dominant hand establishes contact with the patient's spine in the sphinx position, targeting the vertebrae between T11 (thoracic vertebra 11) and L2 (lumbar vertebra 2). As the patient exhales, the practitioner applies gentle, progressive pressure with the aim of lengthening the diaphragmatic pillars. This lengthened state is ideally maintained even during inhalation.

Through this indirect approach on the diaphragm, the technique facilitates the release of its powerful posterior fibers.

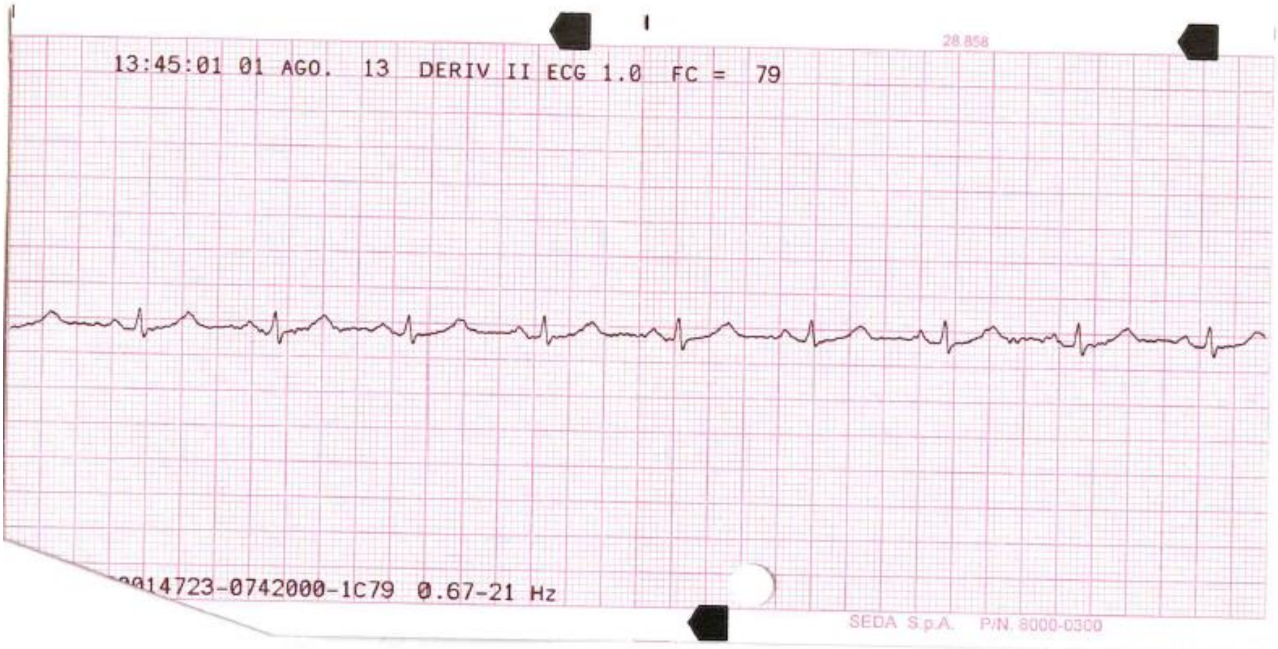
The practitioner's other hand assumes a stabilizing role.



RESULTS

The implemented manual procedures and postural maneuvers resulted in a rapid resolution of TS, with the HR stabilizing at 75 bpm. However, the patient subsequently underwent comprehensive cardiological evaluations and explored surgical options for potential treatment of the HH.

Second electrocardiographic evaluation



Sinus rhythm. Average heart rate 79 bpm.

Conclusion and Discussion

This case report, presented ten years ago, aimed to explore the use of manual therapy for TS associated with HH. While initial support for the underlying physiological concepts was limited (6), the documented case with ECG confirmation provided valuable evidence for the technique's effectiveness. This led to its acceptance as an abstract at the Italian Society of Emergency Medicine congress.

Over time, accumulating scientific evidence has strengthened the support for this approach. In my experience as an emergency physician and osteopath, I have successfully applied this technique to additional patients with similar presentations, achieving symptom resolution in at least two cases. However, continuous ECG recordings were unavailable in these instances, limiting formal documentation.

It is important to acknowledge that a patient's willingness to cooperate with manual therapy in the emergency room setting can influence success rates. A more relaxed and controlled environment, such as a private practice, might improve treatment efficacy.

In conclusion, this report highlights the potential of osteopathic interventions for emerging pathologies like TS associated with HH. Further research is warranted to explore the broader application of these techniques within emergency medicine.

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