Morphological Variation of the Carotid Sinus Location
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Abstract

Background: Carotid sinus massage is widely used to detect carotid sinus hypersensitivity in patients presenting with syncope. Recent guidelines recommend 5 to 10 seconds of carotid sinus massage in supine and upright positions with beat-to-beat monitoring, but somebody did not respond to the procedure.

Method and result: The aim of this study was to describe the common Carotid Artery Bifurcation (CB). Measurements were performed on 100 cadavers by the direct inspection method. The vertebra level of CB was differently distributed in distance of the whole neck measured along the vertebral column between upper borders of C1-C2 to lower border of C5. 54% of the level of CB was asymmetrical between the right and left side.

Conclusion: We showed the anatomical variation of carotid sinus location. Anatomical locations of the carotid sinus bifurcation indicated wide variability. This variation was found to have an impact on the pressure transmission at the carotid sinus region in those individuals that displayed the superior/inferior range of carotid sinus loci.

Keywords: Carotid sinus massage; Carotid artery bifurcation; Autopsy

Introduction

Carotid sinus hypersensitivity (CSH) is the exacerbation of a reflex present in healthy individual. The European Society of Cardiology defined this condition as Asystole lasting for at least 3 seconds, or a drop in systolic blood pressure of at least 50 mmHg, provoked by 5 to 10 seconds of Carotid Sinus Massage (CSM) [1]. It is characterized by prolonged heart rate slowing or a profound drop in systolic blood pressure in response to carotid sinus massage [2]. Although CSM is generally safe, there are some potentially serious complications, of which the best known include Thromboembolic stroke and prolonged Asystole or Hypotension. CSH is a well-recognized cause of syncope and falls in older persons. [3]. In foreign literature, predictors of cardio-inhibitory response have been described in only a few studies, most of which with a small number of patients [3,4]. Doubts still exist about the clinical meaning of the cardio-inhibitory response [5,6]. It is generally accepted that a blow or a short compression of the side of the neck stimulating the carotid sinus can lead to circulatory collapse resulting from activation of an arterial baroreflex controlling the heart rate. We examined the variability of carotid sinus location.

Materials and Methods

100 subjects were randomly selected. At autopsy, all measurements were performed on 100 subjects (40 female and 60 male), ranging in age from 18 to 104 years. The subjects died of natural or traumatic causes presenting with syncope. Recent guidelines recommend 5 to 10 seconds of carotid sinus massage in supine and upright positions with beat-to-beat monitoring, but somebody did not respond to the procedure. The study was approved by the ethical committee of our university. Carotid sinus massage is widely used to detect carotid sinus hypersensitivity in patients presenting with syncope. Recent guidelines recommend 5 to 10 seconds of carotid sinus massage in supine and upright positions with beat-to-beat monitoring, but somebody did not respond to the procedure.

Results

Most of Carotid Bifurcations (CB) was found at the level of C3. The vertebra level of CB was differently distributed in distance of the whole neck measured along the vertebral column between upper borders of C1-C2 to lower border of C5 (Chart 1). 54% of the level of CB was asymmetrical between the right and left side. To illustrate the diversity that may occur in the anatomical location of the carotid sinus, autopsy results of the carotid bifurcation were obtained and matched to the cervical vertebra images (Figure 1). Anatomical locations of the carotid sinus bifurcation indicated wide variability.

Discussion

Most previously reported cases occurred when carotid sinus massage was used in an attempt to terminate supraventricular tachycardia, and many patients were reported to have had other coexisting condition including Ischemic Heart Disease, Heart failure.
and Atrioventricular Block. Parry in 1799, Waller in 1862, and Landois in 1865 were among the first authors to report that a compression of the side of the neck could lead to circulatory collapse [7]. However, they gave no pathophysiological explanation for the phenomenon. In 1868, Czermak wrote that it was the result of direct excitation of the Vagal Nerve [8]. Hering in 1924 performed animal experiments and observed that compression of the neck influenced heart rate [9]. He explained this observation by a mechanical stimulation of the carotid sinus, thus describing the arterial Baroreflex. Franke delineated in his papers different types of responses of the syndrome of the carotid sinus with important inter individual variations [10]. The regulatory effect of carotid sinus stimulation is often used in cardiology for diagnosis and therapy [11,12]. Rossen et al. did not, however, observe any cardiac arrest in more than 100 healthy strangled subjects, although when the neck compression was maintained for over 30s, he did note Bradycardia [13]. Observations have shown that response to sinus carotid stimulation have important inter individual variations and that there is no evidence suggesting that carotid stimulation alone can provoke death. A significant anatomical variation in the location of the carotid sinus was measured and the location of the carotid sinus should be verified. This variation was found to have an impact on the pressure transmission at the carotid sinus region in those individuals. The clinically relevant variations of the location of carotid bifurcation should be considered by physicians during neck examination.

**Disclosures**

A significant anatomical variation in the location of the carotid sinus was measured and the location of the carotid sinus should be verified. This variation was found to have an impact on the pressure transmission at the carotid sinus region in those individuals.

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