ORIGINAL RESEARCH

Evaluation of location of carotid bifurcation

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ABSTRACT
Background: In the late 19th and early 20th centuries, the pathophysiology of asphyxia death—particularly hanging death—was essentially the purview of forensic medicine, and asphyxia-related scientific fields continue to advance today. The present study was conducted to evaluate location of carotid bifurcation. **Materials & Methods:** 90 cadavers of both genders were selected. Carotid bifurcation level was compared to the level of cervical vertebra. **Results:** Out of 90 victims, 57 were males and 33 were females. Location of carotid bifurcation on right and left side was C1-C2 in 3 and 5, C2 in 2 and 3, C2-C3in 16 and 12, C3 in 38 and 35, C3-C4 in 21 and 20, C4 in 3and 7, C4-C5 in 4 and 4 and C5 in 2 and 4 respectively. **Conclusion:** The most common location of carotid bifurcation on right and left side was at C3-C4 level.
Keywords: carotid bifurcation, cadavers, cervical vertebra

INTRODUCTION

In the late 19th and early 20th centuries, the pathophysiology of asphyxia death—particularly hanging death—was essentially the purview of forensic medicine, and asphyxia-related scientific fields continue to advance today.[1] It is widely acknowledged that mechanical asphyxia, which includes hanging, ligature strangulation, and manual strangling, can result in death due to a confluence of spinal cord damage, airway obstruction, carotid sinus stimulation, and neck artery compression.[2] Only a few studies, mainly involving a limited number of patients, have described determinants of cardioinhibitory response in international literature. There are still questions regarding the cardioinhibitory response's clinical significance.[3,4]

It is widely acknowledged that by activating an arterial baroreflex that regulates heart rate, a blow or brief compression of the side of the neck stimulating the carotid sinus can cause cardiac collapse.[5] We saw suicide hanging instances with bleeding in the middle region of the r-sternocleidmastoidal muscle, manual strangulation without facial congestion, and no ligature in front of the neck.[6] In the final instance, the carotid bifurcation (CB) is situated at the top of the muscle hemorrhage and between C2-3.[7]The present study was conducted to evaluate location of carotid bifurcation.

MATERIALS & METHODS

The study was conducted on 90 cadavers of both genders. Family members gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Carotid bifurcation level was compared to the level of cervical vertebra.Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of victims

Total- 90		
Gender	**Male**	**Female**
Number	57	33

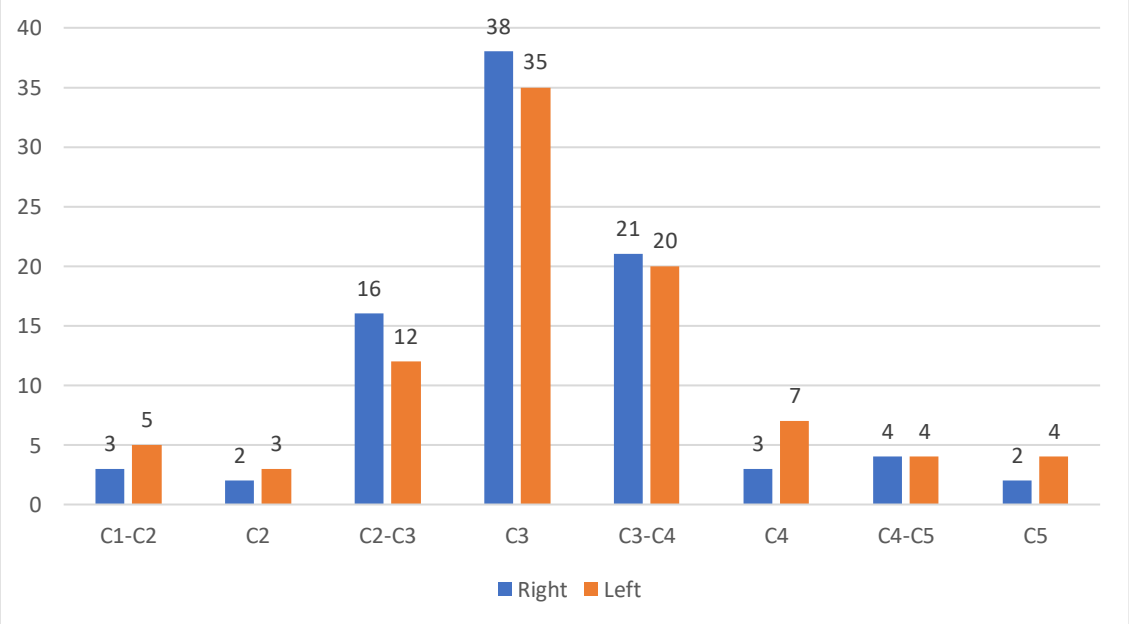
Table I shows that out of 90 victims, 57 were males and 33 were females.

Table II Assessment of location of carotid bifurcation

Carotid bifurcation	Right	Left	P value
C1-C2	3	5	0.74
C2	2	3	
C2-C3	16	12	
C3	38	35	
C3-C4	21	20	
C4	3	7	
C4-C5	4	4	
C5	2	4	

Table II, graph I shows that location of carotid bifurcation on right and left side was C1-C2 in 3 and 5, C2 in 2 and 3, C2-C3 in 16 and 12, C3 in 38 and 35, C3-C4 in 21 and 20, C4 in 3 and 7, C4-C5 in 4 and 4 and C5 in 2 and 4 respectively.

Graph I Assessment of location of carotid bifurcation



DISCUSSION

The primary cause of hanging death is thought to be the obstruction of airways caused by the victim's body weight's gravitational pull, thus hanging deaths are classified as mechanical asphyxia.[8] Some people believe that death results from the carotid sinus reflex.[9,10] The majority of cases previously documented involved the use of carotid sinus massage to try to stop supraventricular tachycardia, and many patients were found to have had ischemic heart disease, heart failure, and atrioventricular block as coexisting diseases.[11,12]The present study was conducted to evaluate location of carotid bifurcation.

We found that out of 90 victims, 57 were males and 33 were females. Furukawa et al[13] in their study, measurements were performed on 100 cadavers by the direct inspection method. CB level was compared to the level of cervical vertebra. Most frequency of CB was found at the level of C3. CB was variously distributed from the intermediate position of C1-2 to lower border of C5 on the vertebral column in Japanese population. The distribution pattern may be different from other population. 54% of the level of CB was asymmetrical between the right and left side

We found that location of carotid bifurcation on right and left side was C1-C2 in 3 and 5, C2 in 2 and 3, C2-C3in 16 and 12, C3 in 38 and 35, C3-C4 in 21 and 20, C4 in 3and 7, C4-C5 in 4 and 4 and C5 in 2 and 4 respectively. Ribeiro RA et al[14]correlated the common carotid artery (CCA) bifurcation level with important anatomical landmarks used regularly in clinical practice. Forty-six necks from male embalmed human cadavers were evaluated. The CCA as the external (ECA) and internal (ICA) carotid arteries diameters were studied with the aid of an electronic digital caliper. No differences were found between sides in any level studied. The CCA bifurcation level was measured in relation to clinically relevant anatomical landmarks (superior level of the thyroid cartilage, mandible angle and ear lobe) and the bifurcation level according to the cervical vertebra level was also investigated. The study showed that the superior border of the thyroid cartilage was the most stable anatomical landmark for predicting the CCA bifurcation level. It is important to mention that from

all the landmarks studied, the cervical vertebra was the only one to show differences between sides, with the left side bifurcation level more variable than the right side.

Anangwe et al[15]described the topography and anatomical variations of the carotid arteries. The bifurcation of the commonest carotid artery was high (above the reference points) in 63.8% of vessels and the external carotid was antero-lateral to the internal carotid artery in 30% of the vessels. A linguo-facial trunk was the most common variation of the external carotid artery. The origin of the right common carotid artery was high and low in 10% and 2.6% of vessels respectively.The carotid arteries showed important variability and thus emphasise caution for clinicians during surgical procedures in the neck.

Lo et al[16]described the anatomy of the CCA bifurcation relative to its surrounding structures. They dissected a total of 67 carotid specimens from 36 embalmed cadavers. CCA bifurcation occurred at the superior border of thyroid cartilage in 39% and at the body of hyoid bone in 40% of specimens.The superior thyroid artery arose more commonly from the CCA (52.3%) than the external carotid artery (46.2%). The vagus nerve was posterior to the carotid bifurcation in 40 (60%), posterior-lateral in 24 (36%), posterior-medial in 2 (3%) and anterior-lateral in 1 specimen (1.5%). The hypoglossal nerve was closer to the CCA bifurcation when the CCA bifurcated at the level of the hyoid bone than when it bifurcated at the superior border of the thyroid cartilage ($P < 0.05$). The correlation of the common facial vein and the carotid artery was highly variable.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that the most common location of carotid bifurcation on right and left side was at C3-C4 level.

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