Correlative Study of Diameter of Carotid Canal with Cranial Index in Maharashtra Population

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Abstract

Background: Diameter of carotid canal is very much important because hypo-plastic of CC leads to multiple of neuro vascular complications, passing through these CC.

Method: 45 male, 30 female adult non-pathological, dried crania were studied. The cranial Index was measured by winged calliper and diameter of CC by digital verniercalliper. The obtained values were correlated statistically.

Results: Mean value of CI 64.09 (± 0.35) in male, 70.06 (± 0.98) in females crania Diameter of rt. Cc 0.76 (± 0.14) in male, 0.67 (± 0.09) in female crania, 0.74 (± 0.10) diameter of cc in males, 0.54(± 0.08) in cc of females crania and correlation coefficient of both male and female with CI and CCwere highly significant ($p<0.001$).

Conclusion: Correlative coefficient study of CI and CC in both gender crania will be useful neuro-physician, neuro-surgeon,radiologist, medico-legal expert, anthropologist and anatomist because morpho-metric values of mesodermal derivatives are uncertain.

Keywords: Vernier Calliper, Winged calliper, cranial Index, carotid canal, Maharashtra

Introduction

Carotid canal (CC) is located within the middle cranial fossa at the bone [(1)]. It is delimited by the posterior margin of the greater wing of sphenoid bone anteriority and the basilar aspect of is divided into posteriorly [(2)]. CC is divided into three characteristic parts viz. ascending petrous, transverse petrous and ascending cavernous. The internal and external apertures, which constitute the CC are situated in relation to other foramina, grooves and impressions containing a number of neuro vascular and labyrinthine structures in close proximally[(3)].

CC transmits Internal carotid artery (ICA) which is the major other deeper regions of head such as the eye, accessory organs and the nose. The CC also transmits the sympathetic nerve plexus and the internal carotid venous plexus, a venous network around ICA connecting with the cavernous sinus and the internal jugular vein [(4)].

All through skull base anatomy is regarded as the central determinant of sex in forensic medicine, the role of foramina as neuro vascular routes is especially important in surgical environment. Since hypo plastic carotid canal are considered to be moyamoya disease early detection of such changes may prevent ICA stenosis and subsequent stenosis of carotid canal itself. Hence attempt is made to correlate the

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non-pathological dried CC with CI so that this study will be beneficial to neuro surgeon,anthropologist, medico-legal expert and anatomist.

Material and Method

45 male and 30 females adult crania available in Anatomy and Forensic department of SSPM Medical college, Padave, Sindhudurga Maharashtra-416534 were studied.

Inclusive Criteria: Non pathological dried adult after confirmation of gender differences were selected for study.

Exclusion Criteria: Broken, pathological crania were excluded from study.

Method

Each cranium was put in anatomical position cranial Index was measured was measured by winged calliper from Nasion to Inion and one supra mastoid crest to another supra mastoid crests and divided by 100.

Diameter of carotid (CC) and left were measured by digital vernier calliper. The obtained results were correlated.

The duration of study was from June-2020 to July-2022.

Statistical analysis: The correlated values of cranial Index and diameter of CC in both sexes were correlated by coefficient and regression equation method and mean values of both sexes by t test. The statistical analysis was carried out in SPSS software.

Observation and Results

Table 1: Mean values CI and diameters of CC in both sexes

In males CI = 64.09 (± 0.30) right CC 0.76 (±0.14), 0.74 (± 0.10) in left CC.

In females – CI 70.6 (± 0.98), 0.67 (±0.09) diameter of rt. CC 0.54 (±0.08)

Table 2: Correlation between CI with diameter of CC in male crania –

r=0.64, t test 5.46 and p<0.00, CT – verses right CC

r= 0.63, t test 5.31 and p<0.01 in CI versus left CC

Table 3: Correlation between cranial Index with diameter of right and left carotid canal in females.

R=0.66 is correlation, t test 4.64 and p value is p<0.001 in CI versus right carotid canal (CC) female

Similarly, r=0.62, t test 4.18 and p<0.01 in versus left CC in females

Table 1: Average values of cranial index. Diameter of cranial canal in Male and female

	Cranial index (Mean ± SD)	Diameter of right carotid (cm) (Mean ± SD)	Diameter of left carotid canal (cm) (Mean ± SD)
Male	64.09 ±0.35	0.76 ±0.14	0.74 ±0.10
Female	70.06 ±0.98	0.67 ±0.09	0.54 ±0.08

Table 2: Correlation between Cranial index with diameter of right and left carotid canal in male

Male	N	Correlation coefficient	Test statistic and P value
Cranial index V/s diameter of right carotid canal	45	r = -0.64	t = 5.46 , P<0.01
Cranial index V/s diameter of left carotid canal	45	r = -0.63	t = 5.31 , P<0.01

Statistically there is significantly negative correlation observed between Cranial index and diameter of right and left carotid canal (P<0.01) of male.

Table 3: Correlation between Cranial index with diameter of right and left carotid canal in female

Female	N	Correlation coefficient	Test statistic and P value
Cranial index vs diameter of right carotid canal	30	r = -0.66	t = 4.64, P<0.01
Cranial index vs diameter of left carotid canal	30	r = -0.62	t = 4.18, P<0.01

Statistically there is significantly negative correlation observed between Cranial index and diameter of right and left carotid canal (P<0.01) of female.

Discussion

Present correlative efficient study of diameter of CC with CI in Maharashtra Population. Mean values of CI in 64.09 (± 0.35) in male crania, 70.06 (± 0.08) in female crania, Diameter of right CC 0.76 (± 0.14) in male, 0.67 (± 0.09) in females Diameter of left CC 0.74 (± 0.10) in male crania, 0.54 (± 0.08) in female crania (Table-1) In the correlation of CI with diameter of right and left CC in male crania corrective co-efficient was r=0.64, t test -5.46 and p<0.001 in right CC. In left CC r=-0.63, t test 5.31 and p<0.001 (Table-2). Correlation between CI with diameter of CC in right and left CC in female r=0.66 correlative coefficient, t test 4.64 and p<0.01. In diameter of left CC r=0.62 was correlative coefficient, t test was 4.18 and p<0.001(p value was highly significant). These findings are more or less in agreement with previous studies [5][6][7].

It is interesting note that CI of female is larger than CI of female crania but diameters CC is smaller in female crania than male crania. The probable reason could be hemodynamic presage is more in males than females than it CC again it confirms that hemodynamic pressure is more on right side of the body as compare to left side. The diameter of CC is the land mark for neuro surgeon, neuro physician, and radiologist. During neuro surgery diameter of CC predicts the involvement of ICA bleeding [8]. The increased diameter of CC in males than females is a paedomorphictendency of human skull [9]. Hormonal, nutritional and environmental factors also play vital role for the increased diameter of CC and CI as well.

In addition to this skull itself have become thinner and larger as a result of reduced masticatory musculature and enlargement of brain, might have erased density of Normabasalis to house the bigger brain [10] which might have resulted into smaller diameter of CC in female crania. It is established factor that, bone is highly plastic tissue next to blood.

Normal growth of bone is depending on anterior pituitary which stimulates the cell division in the cartilaginous growth plates. It is ineffective in the absence of sufficient thyroxin Giant and dwarf results from abnormal activities of these glands. The sex hormones and the hormones of adrenal cortex antagonize the action of growth hormone and thyroxin for the proper secretion of these hormones, proper nutritional status and environmental factors also necessary for normal growth the crania.

Abnormalities in diameter of CC could be an indicator of cerebral vascular abnormalities and variations. The increased incidence of aneurysm of internal carotid artery occurs [11].

Summary and Conclusion

The correlative study of diameter of CC with CI in Maharashtra population is useful in advanced microsurgical techniques for the removal advanced lesions or widening the diameter of CC which were once assured inoperable. By these normal values neuro surgeon, radiologist can explore the exact diameter of CC before assessing to surgical procedure and successful to perform micro surgery without injuring adjacent blood vessels, nerves. But this study demands further hormonal, embryological, nutritional, environmental, genetic studies because development of crania is more complicated, the mechanism of formation of complete crania is still unclear, because factor determine the time of ossification are still obscure.

Limitation of study: Owing to limited samples and lack of latest technologies, we have limited findings and results.

- This research paper is approved by Ethical committee of SSPM Medical College Padave, Sindhudurga, Maharashtra – 416534
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