



## **MORFOMETRI TIGA DIMENSI VERTEBRA CERVICAL C3-C7 PADA POPULASI INDONESIA**

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### **Abstrak**

#### **Latar Belakang**

Sebagian besar dari dokter ahli bedah tulang belakang setuju dengan pentingnya mengetahui dan memahami morfologi dari vertebra cervicalis untuk mencegah kerusakan pada struktur struktur penting di area cervical selama prosedur intervensi. Perbedaan pada morphometri cervical spine telah dilaporkan berbeda untuk masing-masing populasi yang ada. Selain itu, pemahaman anatomi pada tulang belakang ini sangat penting dalam pengembangan instrumentasi (*pedicle* dan *lateral mass screw*) terkait dengan vertebra cervical.

#### **Material dan Metode**

Penelitian ini merupakan penelitian cross sectional deskriptif analitik yang dilakukan pada 100 subyek populasi Indonesia dalam rentang usia 20-40 tahun dan berdomisili di Yogyakarta, Indonesia. Sebuah gambar tiga dimensi dari *computed tomographic* digunakan untuk mengukur parameter. Parameter yang digunakan dalam penelitian ini terdiri dari Dimensi *body* : *Anteroposterior Vertebral Body (APVB)*, *Transverse Diameter Vertebral Body (TDVB)*, dan *Vertebral Body Height (VBH)*. Dimensi *Pedicle* : *Pedicle Length (PL)*, *Pedicle Width (PW)*, dan *Transverse Pedicle Angle (TPA)*. Dimensi *Canal* : *Anteroposterior Diameter of Vertebral Canal (APDC)*. Dimensi *Lateral Mass* : *Anteroposterior Diameter of Lateral Mass (APLM)*, *Transverse Diameter of Lateral Mass (TDLM)*, *Height Diameter of Lateral Mass (HLM)*, *Mediolateral angulation of Lateral Mass (MLLM)*, dan *Craniocaudal angulation of Lateral Mass (CCLM)*. Data yang diperoleh dianalisis secara statistik menggunakan SPSS 22 dan uji Independent T-Test.

#### **Hasil**

Pada penelitian ini didapatkan hasil bahwa morphometri cervical vertebrae pada populasi Indonesia berbeda dengan populasi lain di dunia. Ukuran rata-rata pada dimensi vertebral *body*, pedikel, canal, dan lateral mass pada laki-laki lebih besar dibandingkan dengan pada wanita. Parameter APVB terpanjang di C6 ( $14,7 \pm 2,4$  mm) dan terpendek di C3 ( $14,2 \pm 2,1$  mm), TDVB terpanjang di C7 ( $24,2 \pm 3,4$  mm) dan terpendek di C3 ( $19,8 \pm 3,5$  mm), VBH minimum di C5 ( $13,1 \pm 1,4$  mm) dan maksimum di C7 ( $14,6 \pm 1,5$  mm). Pedikel terpanjang (PL) di C7 ( $7,2 \pm 1,1$  mm) dan terpendek di C4 ( $6,76 \pm 1$  mm) sedangkan pedikel terlebar (PW) di C6 ( $6,5 \pm 1,2$  mm) dan tersempit di C3 ( $5,1 \pm 0,7$  mm), TPA terbesar di C5 ( $48,5 \pm 4,7^\circ$ ) dan terkecil di C7 ( $40,59 \pm 6,2^\circ$ ). APDC terbesar di C7 ( $15,96 \pm 1,8$  mm) dan terkecil pada C4 ( $14,6 \pm 1,9$  mm). Pada pengukuran lateral mass didapatkan hasil TDLM terpanjang pada C7 ( $11,7 \pm 1,7$  mm) dan terpendek pada C3 ( $9,7 \pm 1,4$  mm), APLM terbesar pada C7 ( $14,33 \pm 2,8$  mm) dan terkecil pada C3 ( $13,5 \pm 3,5$  mm). HLM terbesar pada C7 ( $13,15 \pm 2,97$  mm) dan terkecil pada C3 ( $11,7 \pm 2$  mm) MLLM terbesar pada C5 ( $26,67 \pm 1,89^\circ$ ) dan terkecil pada C3 ( $24,33 \pm 1,36^\circ$ ) CCLM terbesar pada C7 ( $35,6 \pm 3,3^\circ$ ) dan terkecil pada C3 ( $30,75 \pm 4,4^\circ$ ).

#### **Kesimpulan**

Pada penelitian ini laki-laki memiliki struktur cervical morphometri yang lebih besar bila dibandingkan dengan wanita. Cervical morphometri pada populasi Indonesia didapatkan hasil yang berbeda dibandingkan dengan pengukuran morphometri pada populasi lain di dunia. Hasil penelitian ini memberikan data dasar morfometri vertebra cervical yang dapat digunakan dalam pengembangan instrumentasi spinal implant (*pedicle & lateral mass screw*) vertebra cervical untuk populasi Indonesia.

**Kata kunci:** *Morphometri, CT Scan tiga dimensi, vertebra servikal, populasi Indonesia.*



## **THREE-DIMENSIONAL MORPHOMETRIC STUDY OF CERVICAL VERTEBRAE C3-C7 AMONG INDONESIAN POPULATION**

**Arie Nugroho**

### **Abstract**

#### **Background**

The majority of spine surgeon agree regarding the need for adequate cervical column morphology knowledge to avoid damage in the important structure during fixation of cervical spine. Differences in cervical spine morphometrics have been reported across different study populations. Knowing dimensions of the vertebral morphometry is very important for the development of instrumentation (pedicle and lateral mass screw) related to the cervical spine.

#### **Materials and Methods**

This study was a descriptive analytic study with cross sectional design, conducted in 100 subjects of Indonesian population, age range from 20 – 40 years living in Yogyakarta, Indonesia. Three-dimensional CT scan was used to measure the parameters. The parameters in this study including, Body dimension : Anteroposterior Vertebral Body (APVB), Transverse Diameter Vertebral Body (TDVB), and Vertebral Body Height (VBH). Pedicle dimension : Pedicle Length (PL), Pedicle Width (PW), and Transverse Pedicle Angle (TPA). Canal dimension : Anteroposterior Diameter of Vertebral Canal (APDC). Lateral Mass dimension : Anteroposterior diameter of Lateral Mass (APLM), Transverse diameter of Lateral Mass (TDLM), Height diameter of Lateral Mass (HLM), Mediolateral angulation of Lateral Mass (MLLM), Craniocaudal angulation of Lateral Mass (CCLM). The data obtained were analyzed statistically using SPSS 22.0 and Independent T-Test.

#### **Results**

In this study we get the result that morphometry of Indonesian population different compared to other population in the world. Mean of dimension of vertebral body, pedicle, spinal canal, and lateral mass more larger compared to the male. The anteroposterior diameter vertebral body (APVB) was largest at C6 ( $14,7 \pm 2,4$  mm) and smallest at C3 ( $14,2 \pm 2,1$  mm), transverse diameter vertebral body (TDVB) was longest at C7 ( $24,2 \pm 3,4$  mm) and smallest at C3 ( $19,8 \pm 3,5$  mm), vertebral body height (VBH) was shortest at C5 ( $13,1 \pm 1,4$  mm) and highest at the C7 ( $14,6 \pm 1,5$  mm). The pedicle was longest at C7 ( $7,2 \pm 1,1$  mm) and shortest at C4 ( $6,76 \pm 1$  mm) while the pedicle diameter (PW) was widest at C6 ( $6,5 \pm 1,2$  mm) and narrowest at C3 ( $5,1 \pm 0,7$  mm), the TPA was largest at C5 ( $48,5 \pm 4,7$  °) and smallest at C7 ( $40,59 \pm 6,2$  °). The anteroposterior diameter canal (APDC) was highest at C7 ( $15,96 \pm 1,8$  mm) and shortest at C4 ( $14,6 \pm 1,9$  mm). In measurement of lateral mass we get result TDLM longest at C7 ( $11,7 \pm 1,7$  mm) narrowest at C3 ( $9,7 \pm 1,4$  mm). APLM longest at C7 ( $14,33 \pm 2,8$  mm), narrowest at C3 ( $13,5 \pm 3,5$  mm). HLM longest at C7 ( $13,15 \pm 2,97$  mm) and narrowest at C3 ( $11,7 \pm 2$  mm). MLLM largest at C5 ( $26,67 \pm 1,89$  °) and smallest at C3 ( $24,33 \pm 1,36$  °) CCLM largest at C7 ( $35,6 \pm 3,3$  °) and smallest at C3 ( $30,75 \pm 4,4$  °).

#### **Conclusion**

Cervical morphometry of male Indonesian population larger compared with female. Cervical morphometry of Indonesian population had different result compared to other population in the world. The proposed dimensions of cervical vertebrae can be used as the basic data to design the ideal size of the custom-made spine instrumentation (pedicle and lateral mass screw) for Indonesian population.

**Keywords:** Morphometry, CT scan 3D, cervical vertebrae, Indonesian population.