

ABSTRACT

Background: Increased arterial tortuosity has been suggested as a predisposing factor for carotid artery dissection, which is an important risk factor for development of extracranial carotid artery aneurysms (ECAA). Prior to comparison with non-ECAA controls, the optimal measurement technique should be defined. This study describes the difference between software packages in terms of reproducibility and absolute outcome of arterial tortuosity measurements in ECAA patients.

Methods: CT-angiography analysis was performed on 12 ECAA patients selected from our registry, using four software packages: 3mensio Vascular, TeraRecon, Vital Images, and Aycan OsiriX PRO. The tortuosity index (TI) was calculated from the skull base until the carotid bifurcation and aortic arch, and was defined as the centerline's true length divided by the straight line distance. Intraclass correlation coefficients (ICC) with 95% confidence intervals were calculated to quantify inter- and intraobserver variability within one software package, and differences in measured TI between packages.

Results: Inter-observer agreement was nearly perfect for 3mensio, excellent for Vital Images and OsiriX, and substantial for TeraRecon, with ICC 0.99 (0.96–1.0), 0.90 (0.69–0.97), 0.84 (0.53–0.95), and 0.72 (0.28–0.91), respectively. Intra-observer agreement ranged from ICC 1.0 for 3mensio to 0.91 for TeraRecon. Agreements in TI ranged from ICC 0.99 (0.98–1.0) for 3mensio vs. OsiriX, to 0.95 (0.82–0.98) for 3mensio vs. TeraRecon. Median time needed to complete one round of measurements was highest for OsiriX (p = 0.013).

Conclusions: Carotid artery tortuosity measurements are reproducible and comparable between current commercially available software packages, with high intra-observer agreement. Although the reproducibility differed per software packages, all packages scored an acceptable inter-observer agreement.

BACKGROUND

Increased arterial tortuosity has been suggested as a predisposing factor for carotid dissection, which is an important risk factor for development of ECAA. Prior to comparison with non-ECAA controls, the optimal measurement technique should be defined.

PURPOSE

To describe the difference between software packages in terms of reproducibility and absolute outcome of arterial tortuosity measurements in patients with extracranial carotid artery aneurysms (ECAA).

METHODS

- CTA analysis by 2 observers
- 12 ECAA patients from carotid aneurysm registry*
- Calculation tortuosity index (TI) (Fig. 1)
- Intraclass correlation coefficient (ICC) with 95% confidence interval (CI) to quantify:
 1. inter- and intra-observer reproducibility within one software package
 2. differences in measured TI between packages

* www.carotidaneurysmregistry.com

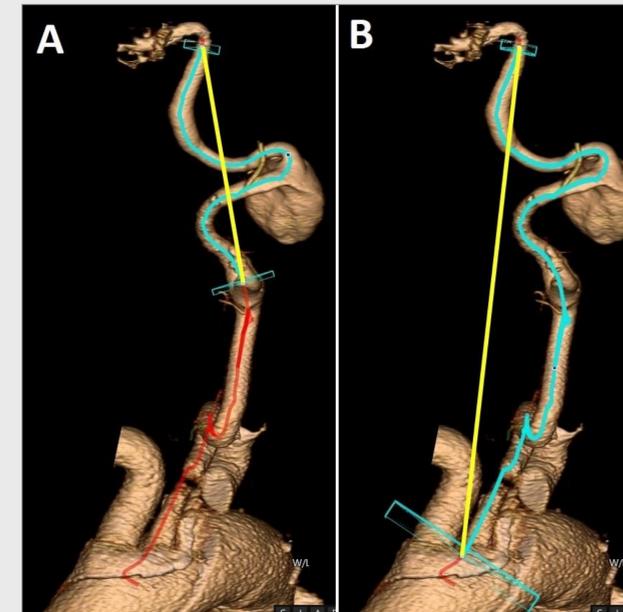


Fig. 1

RESULTS

- **Interobserver reliability** was nearly perfect for 3mensio, excellent for Vital Images and OsiriX, and substantial for TeraRecon (Table 1)
- **Intraobserver reliability** was excellent to nearly perfect (Table 1)

Table 1

	Interobserver reliability*	Intraobserver reliability (average)
3mensio	0.99 (0.96-1.0)	1.0
Vital Images	0.90 (0.69-0.97)	0.98
OsiriX	0.84 (0.53-0.95)	0.93
TeraRecon	0.72 (0.28-0.91)	0.91

* Values are ICC with 95% CI

- **Agreements in TI** ranged from ICC 0.99 (0.98-1.0) for 3mensio vs OsiriX, to 0.95 (0.82-0.98) for 3mensio vs TeraRecon
- **Median time** needed to complete one round of measurements was highest for OsiriX (p=0.013) (Fig. 2)

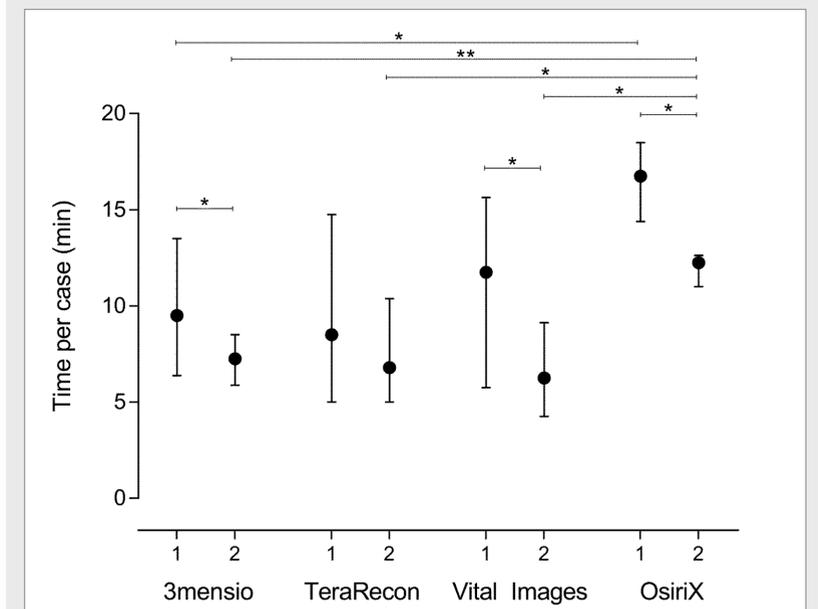


Fig. 2

CONCLUSION

Carotid artery tortuosity measurements are reproducible and comparable between current commercially available software packages.

DISCLOSURES

None