INTRODUCTION
The gold standard for follow up of intracranial aneurysms or AVM repair is conventional angiography. Whole-brain CT digital subtraction angiography (CTA) and CT perfusion (CTP) are beginning to be considered as valuable non-invasive alternatives. The purpose of this study is to quantify the effect of vascular clips and endovascular coils placed for intracranial aneurysms and arteriovenous malformations on whole-brain CTA and CTP values using a 64-detector row dynamic volume CT scanner.

MATERIALS AND METHODS

1) Subjects were evaluated following intracranial device placement (9 endovascular clips, 32 endovascular coils) with and without control patients. All were performed on a 64-detector row dynamic volume CT system. Exact of clip/coil position on CTA was graded as: (1) good, complete subtraction, >75% device subtraction by the software and clip/coil orientation was completely visualized. (2) moderate (≤75% complete subtraction, <25% device subtraction and anatomy >50% could be detected, and/or poor visualization of clip/coil was hampered by clip artifact.

2) Films of 8 objects (analyzed) were placed according to selected anatomical landmarks to ascertain CTP values of regional cerebral blood flow (CBF), cerebral blood volume (CBV) and mean transit time (MTT). CTP data was analyzed using contrast medium injection to minimize hyperemia that occurred outside of the intracranial device vicinity. CCA was performed on a pixel by pixel basis, this is not likely outside of the intracranial device vicinity. Except for the areas immediately adjacent to the device, CTP data was not consistent due to distance of device from bone, variation in software device subtraction, and the degree of beam hardening.

3) CBV, CBF and TTP were increased in a radially distributed pattern that aligned with the device presence. CTP values were lower (p≤0.0001, 95% CI (−2.86, −1.15)) for combined WM and GM, for GM alone (p≤0.0001, 95% CI (−3.17, −1.16)) and for WM alone (p = 0.0139, 95% CI (−3.16, −0.37)).

4) In all cases, CBF, CBV and TTP were increased in a radially distributed pattern that aligned with the device presence. Altered CTP values were present in the surrounding brain until the software reached a pixel with a value of <0 HU. Changes in CTP values matched beam hardening and distortion patterns produced by the device. CTP maps in a patient with an aneurysm, included areas with similar HU, such as bone. Changes in CTP values matched beam hardening and distortion patterns produced by the device. CTP maps in a patient with an aneurysm, included areas with similar HU.

5) TTP is calculated by determining the time from contrast injection to the maximum contrast concentration for a particular pixel. Therefore, TTP can be affected by autoregulatory effect due to the vascular surgery. However, for Case 8, 2 year follow up TTP values were lower than the previous study, which does not support this hypothesis. The high HU values of the clip/coil may have an effect on the global TTP values. However, based on the method of calculating TTP, TTP is derived by pixels, this is not likely consistent with the intracranial device vicinity. Excess for the area immediately surrounding the clip/coil and possibly TTP, CTP values through the brain appear to be unaffected by the device.

Effect of beam hardening from the intracranial device on CTP values: When clip/coil was not present, CTP values were lower (p = 0.0028, 95% CI (−2.087, −0.440)). The statistical significance remained after subtracting the TTP values on a pixel by pixel basis, this is not likely outside of the intracranial device vicinity. Except for the areas immediately adjacent to the device, CTP data was not consistent due to distance of device from bone, variation in software device subtraction, and the degree of beam hardening.

6) CTP values were not consistent due to distance of device from bone, variation in software device subtraction, and the degree of beam hardening.

7) TTP is calculated by determining the time from contrast injection to the maximum contrast concentration for a particular pixel. Therefore, TTP can be affected by beam hardening and distortion patterns produced by the device. Although CTP data was present in the surrounding brain until the software reached a pixel with a value of <0 HU. Changes in CTP values matched beam hardening and distortion patterns produced by the device. CTP maps in a patient with an aneurysm, included areas with similar HU, such as bone. Changes in CTP values matched beam hardening and distortion patterns produced by the device. CTP maps in a patient with an aneurysm, included areas with similar HU.

8) When device was not present, CTP values were lower (p = 0.0028, 95% CI (−2.087, −0.440)). The statistical significance remained after subtracting the TTP values on a pixel by pixel basis, this is not likely outside of the intracranial device vicinity. Except for the areas immediately adjacent to the device, CTP data was not consistent due to distance of device from bone, variation in software device subtraction, and the degree of beam hardening.

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