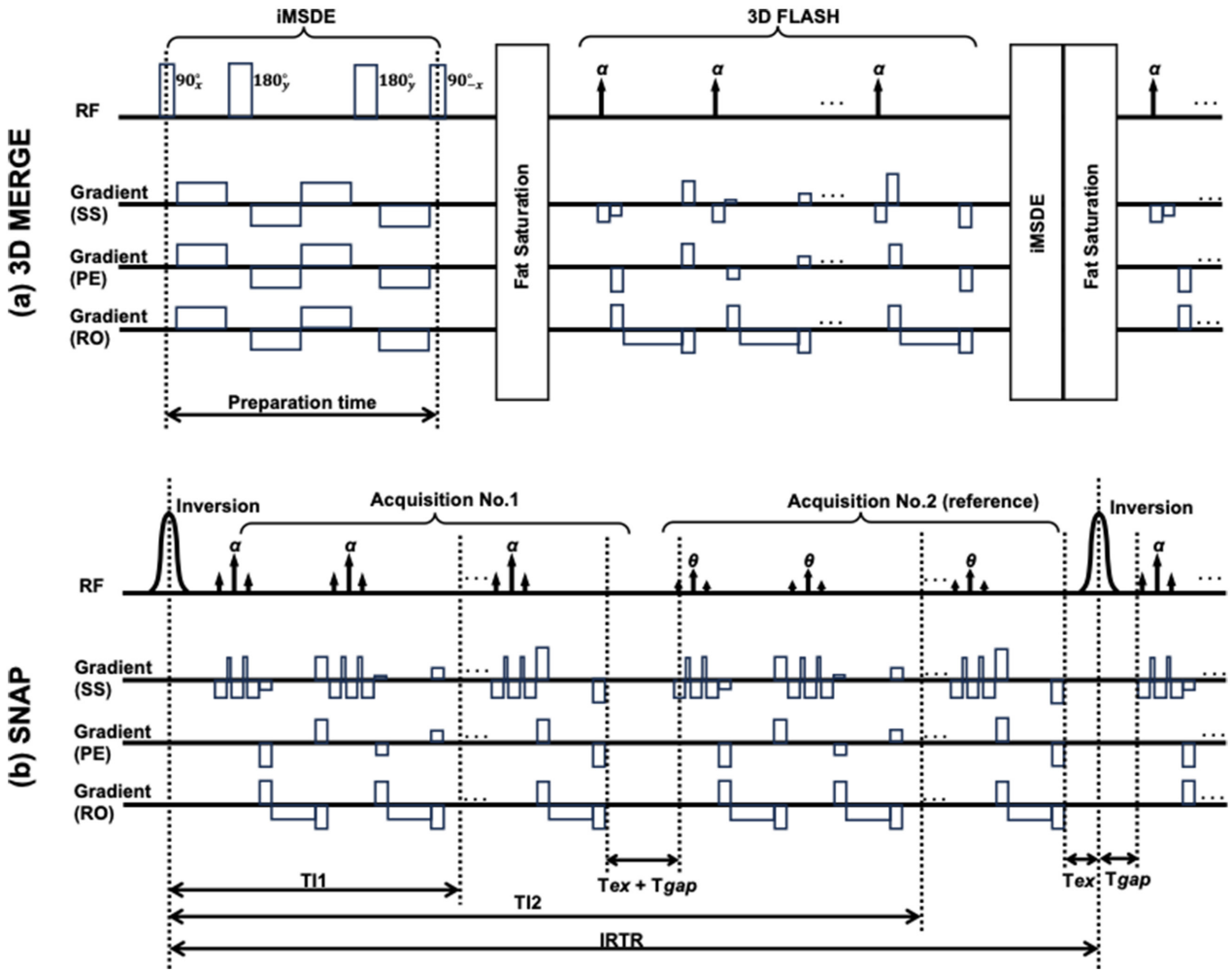

Figure S1 Sequence diagrams of (A) 3D MERGE and (B) SNAP. In 3D MERGE, iMSDE preparation and fat saturation are applied before 3D FLASH. In SNAP, non-selective inversion recovery is implemented, and water excitation pulses (1-2-1 binominal module) are used for both inversion acquisitions, with each arrow representing one sub-pulse among the water excitation module. 3D, 3 dimensional; MERGE, motion-sensitized driven equilibrium prepared rapid gradient echo; SNAP, simultaneous non-contrast angiography and plaque; iMSDE, improved motion-sensitized driven equilibrium; FLASH, 3 dimensional fast low angle shot; SS, slab selective; PE, phase encoding; RO, readout.

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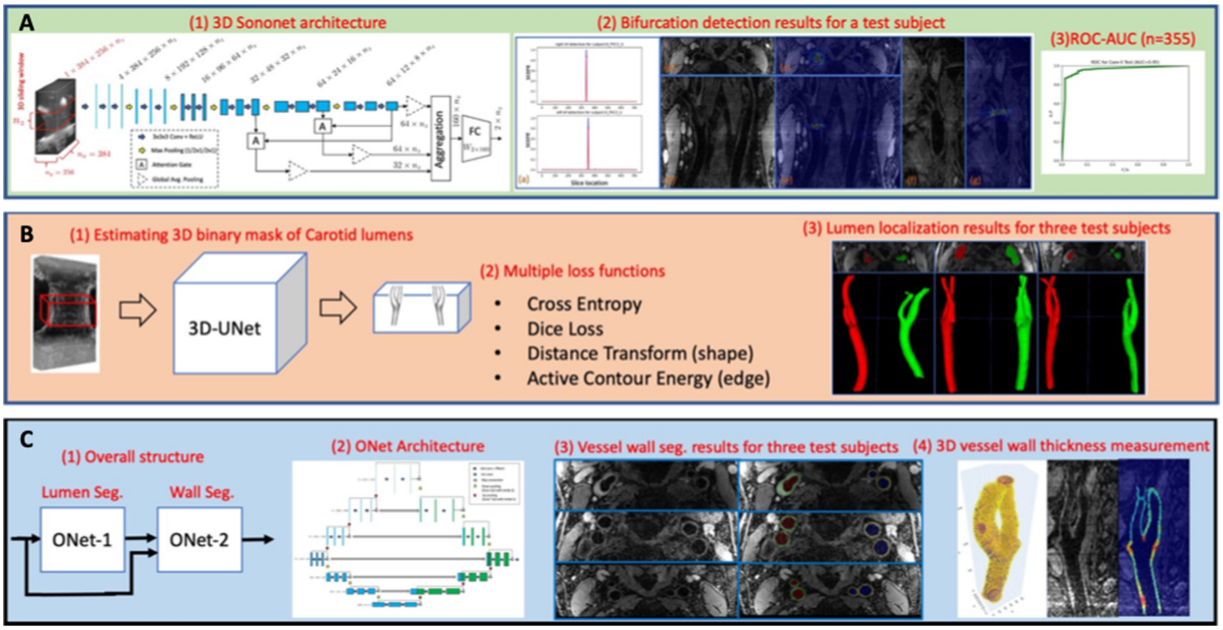

Figure S2 Schematic diagram of the deep-learning based automatic carotid vessel wall imaging processing framework, 3D LATTE. (A) bifurcation detection. (B) 3D segmentation of carotid lumens. (C) Final lumen and vessel wall segmentation, and the 3D thickness measurement using the Laplacian method. This figure was adapted based on our previous abstract: "HashemizadehKolowri S, Nadin, Canton G, Balu N, Hatsukami T, Yuan C, editors. Automated Localization of the Extracranial Carotid Artery in Black Blood Contrast MR Images Using a Deep Learning Approach. Proc Intl Soc Mag Reson Med; 2023." 3D, 3 dimensional; LATTE, localization, analysis, and thickness and tissue evaluation.

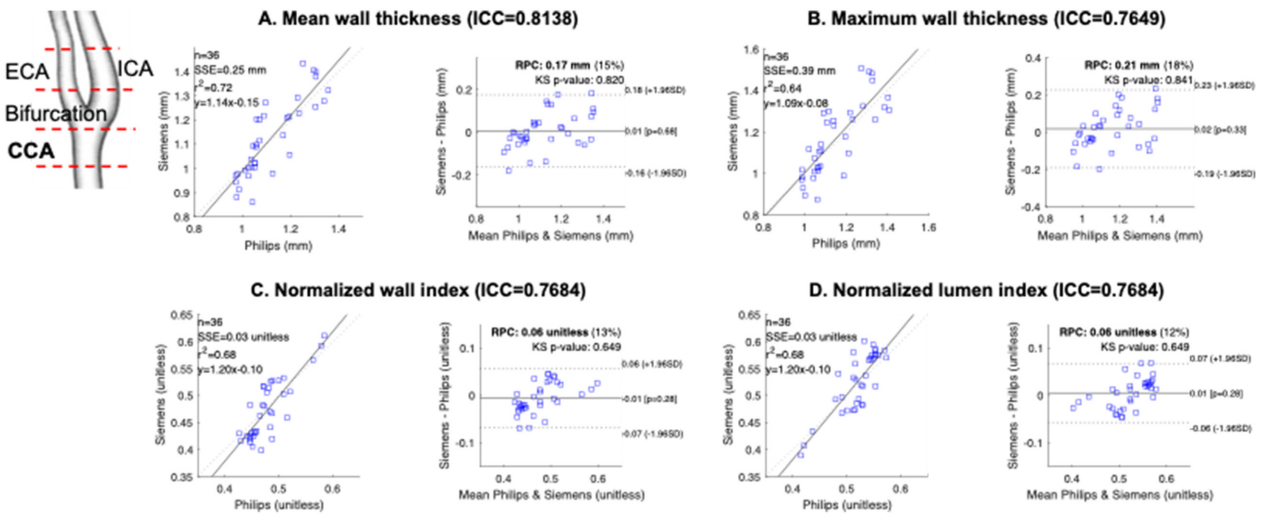

Figure S3 Comparison of carotid arterial morphological measurements from 3D MERGE images on the two vendors in the CCA region. Four location-specific metrics, mean wall thickness (A), maximum wall thickness (B), normalized wall index (C), and normalized lumen index (D), were computed at each distance of a coordinate system from CCA to the ICA centered on the bifurcation. Then each metric was averaged in the CCA region (ranging from −31.5 to −10.5 mm). Bland-Altman analysis and ICC were used to quantify the consistency of measurements between the two vendors. Results show that all metrics have good consistency (ICC >0.75), with 1.96 standard deviations ranging from 12% to 18%. 3D, 3 dimensional; MERGE, motion-sensitized driven equilibrium prepared rapid gradient echo; ICC, intraclass correlation coefficient; CCA, common carotid artery; ICA, internal carotid artery.

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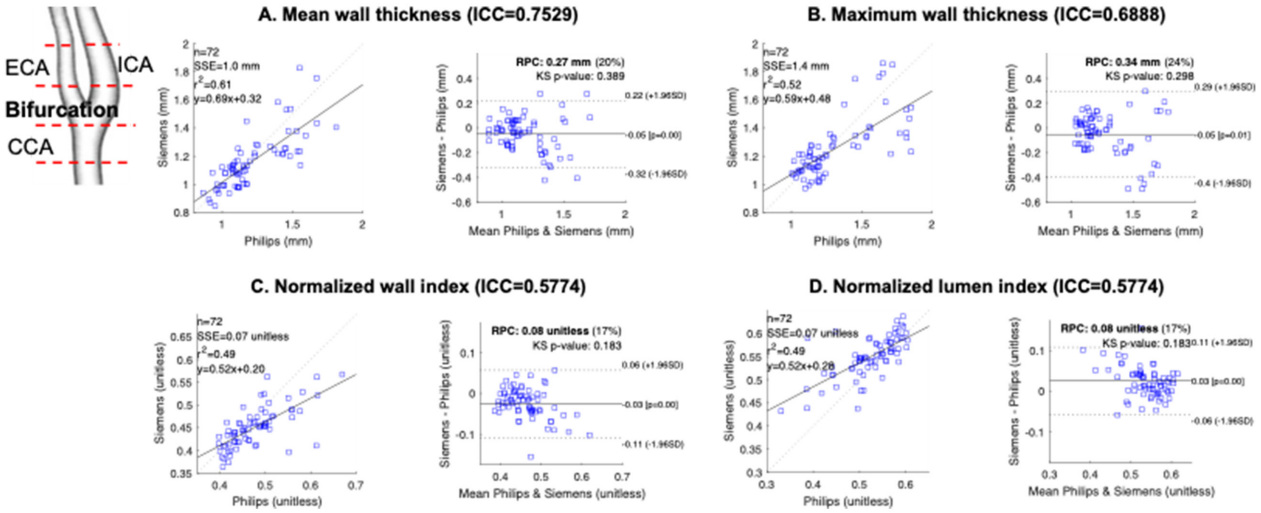

Figure S4 Comparison of carotid arterial morphological measurements from 3D MERGE images on the two vendors in the bifurcation region. Four location-specific metrics, mean wall thickness (A), maximum wall thickness (B), normalized wall index (C), and normalized lumen index (D), were computed at each distance of a coordinate system from CCA to ICA/ECA centered on the bifurcation. Then each metric was averaged in the bifurcation region (ranging from –10.5 to 10.5 mm). Bland-Altman analysis and ICC were used to quantify the consistency of measurements between the two vendors. Results show that mean wall thickness has good consistency (ICC >0.75) and the other metrics have moderate consistency (ICC >0.5), with 1.96 standard deviations ranging from 17% to 24%. 3D, 3 dimensional; MERGE, motion-sensitized driven equilibrium prepared rapid gradient echo; CCA, common carotid artery; ICA, internal carotid artery; ICC, intraclass correlation coefficient; ECA, external carotid artery.

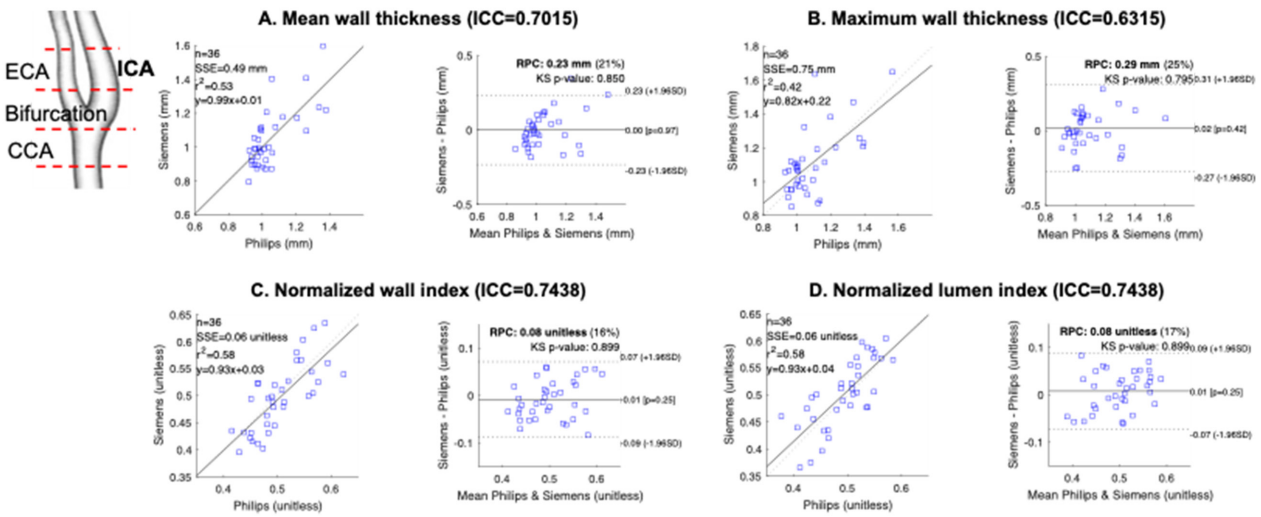

Figure S5 Comparison of carotid arterial morphological measurements from 3D MERGE images on the two vendors in the ICA region. Four location-specific metrics, mean wall thickness (A), maximum wall thickness (B), normalized wall index (C), and normalized lumen index (D), were computed at each distance of a coordinate system from CCA to ICA centered on the bifurcation. Then each metric was averaged in the ICA region (ranging from 10.5 to 31.5 mm). Bland-Altman analysis and ICC were used to quantify the consistency of measurements between the two vendors. Results show that all metrics have moderate consistency (ICC >0.5), with 1.96 standard deviations ranging from 16% to 25%. 3D, 3 dimensional; MERGE, motion-sensitized driven equilibrium prepared rapid gradient echo; ICA, internal carotid artery; ICC, intraclass correlation coefficient; CCA, common carotid artery.

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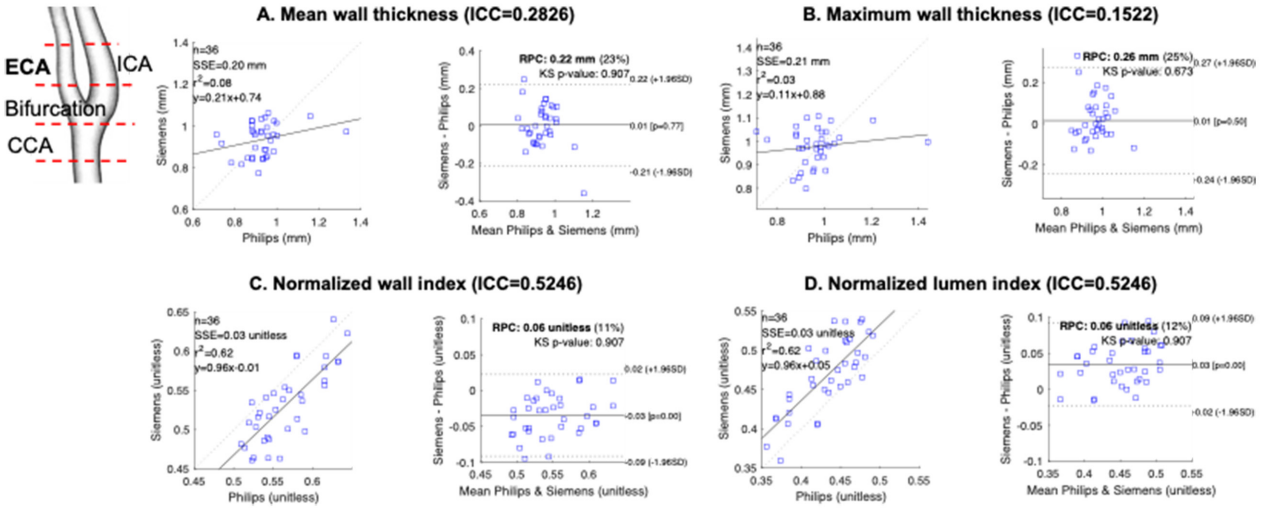

Figure S6 Comparison of carotid arterial morphological measurements from 3D MERGE images on the two vendors in the ECA region. Four location-specific metrics, mean wall thickness (A), maximum wall thickness (B), normalized wall index (C), and normalized lumen index (D), were computed at each distance of a coordinate system from CCA to ECA centered on the bifurcation. Then each metric was averaged in the ECA region (ranging from 10.5 to 31.5 mm). Bland-Altman analysis and ICC were used to quantify the consistency of measurements between the two vendors. Results show that mean wall thickness and maximum wall thickness have poor consistency (ICC <0.5), and normalized wall index and lumen index have moderate consistency (ICC >0.5), with 1.96 standard deviations ranging from 11% to 25%. 3D, 3 dimensional; MERGE, motion-sensitized driven equilibrium prepared rapid gradient echo; ECA, external carotid artery; ICC, intraclass correlation coefficient; CCA, common carotid artery.

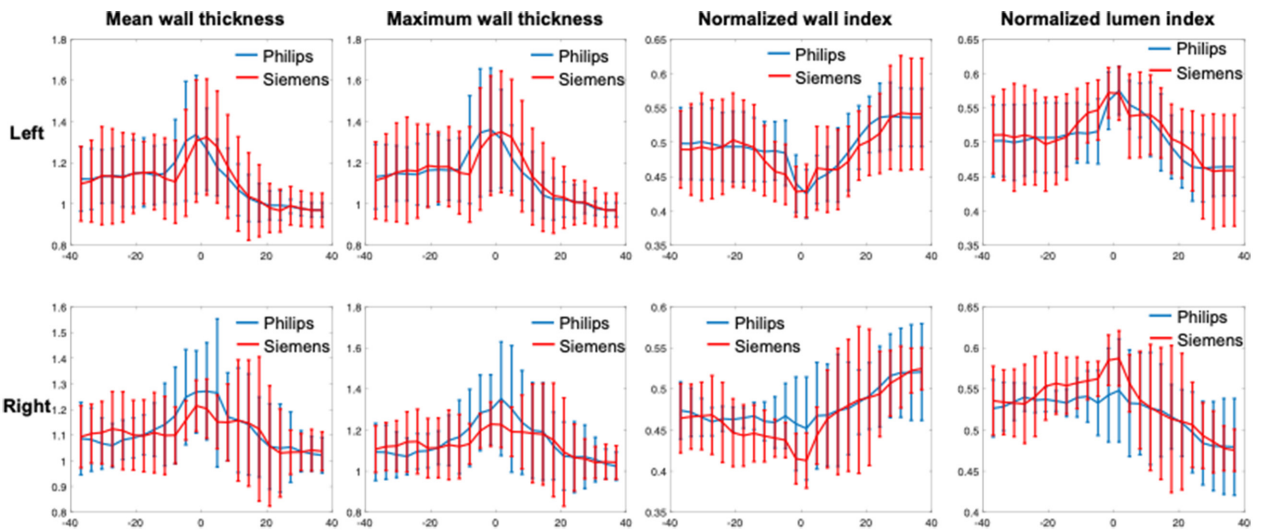

Figure S7 The quantitative metrics measured in Philips and Siemens scanner along the coordinate from CCA to ICA, with center being the bifurcation slice. In each plot, the average difference of all 6 volunteers is displayed as the curve, and the standard deviation as the error bar; left and right carotid arteries are displayed separately. It is observed that both vendors exhibit similar trend of metric distribution along the artery. Mean wall thickness and maximum wall thickness have highest value around the bifurcation. Normalized wall index has lowest value in the bifurcation and highest value in upper region of ICA, while normalized lumen index have highest value in the bifurcation and lowest value in upper region of ICA. CCA, common carotid artery; ICA, internal carotid artery.

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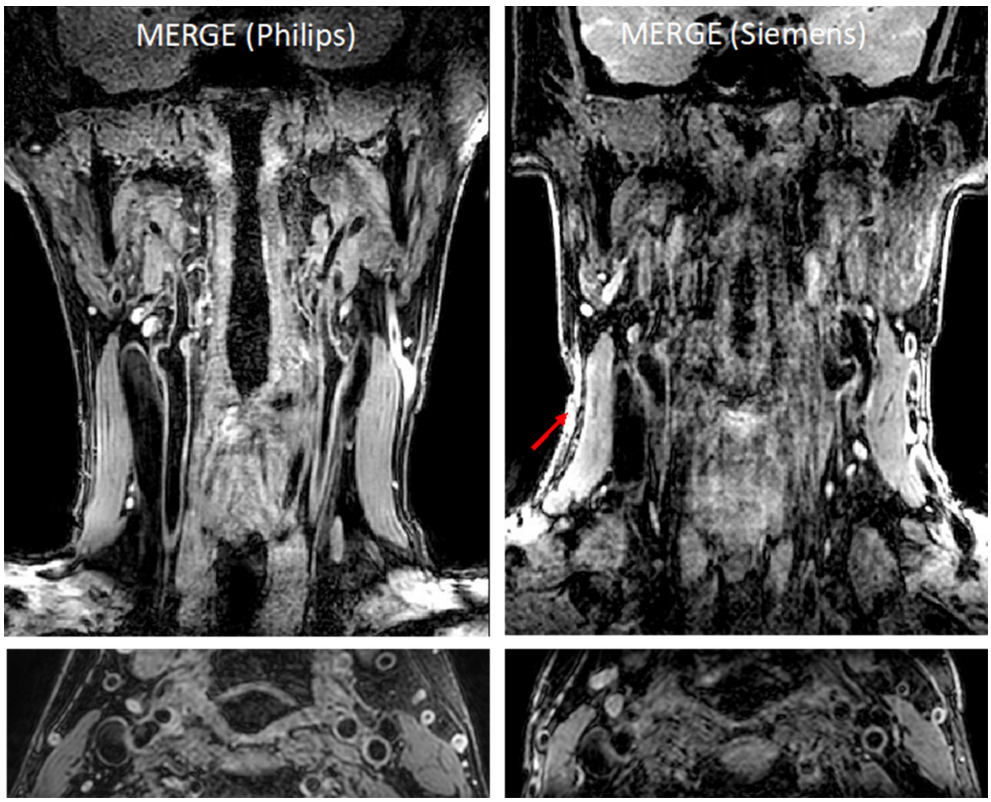

Figure S8 3D MERGE images of one subject that has a low image quality score on Siemens. The arrowhead points out the high-intensity signal next to the coil surface, which is probably the source of stronger motion artifacts. 3D, 3 dimensional; MERGE, motion-sensitized driven equilibrium prepared rapid gradient echo.

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