

Analysis of Images According to the Fluid Velocity in Time of Flight Magnetic Resonance Angiography

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In this study we evaluated that flow rate changes affect the TOF(time of flight) image in a three-dimensional TOF angiography. We used a 3.0T MR System, SENSE head coil and a non pulsatile flow rate model. The flow rate model was composed of plastic body and a polyethylene tube, tube had through the plastic body. The inner diameter of the tube was 0.211cm, the conduit area was 0.26cm². Saline was used as a fluid injected at a flow rate of 11.4, 20.0, 31.4, 40.0, 51.5, 60.0, 71.5, 80.1, 91.5, 100.1 cm/sec by auto injector. The fluid signal strength, phantom body signal strength and background signal strength were measured at 1, 5, 10, 15, 20 and 25th cross-section in the experienced images and then they were used to determine signal-to-noise ratio and contrast to-noise ratio. The inlet, middle and outlet length were measured using coronal images obtained through the maximum intensity projection method.

As a result, the length of inner cavity at the flow rate of 11.4cm/sec was 2.66 mm with no difference among the inlet, middle and outlet length. We also could know that the magnification rate is 49-55.6% in inlet part, 49-59% in middle part and 49-59% in outlet part, and so the image is generally larger than in the actual measurement. Signal-to-noise ratio and contrast-to-noise ratio were negatively correlated with the fluid velocity and so we could see that signal-to-noise ratio and contrast-to-noise ratio are reduced by faster fluid velocity. Signal-to-noise ratio was 42.2-52.5 in 5-25th section and contrast-to-noise ratio was from 34.0-46.1 also not different, but there was a difference in the 1st section. The smallest 3D TOF MRA measure was 2.51 ± 0.12 mm with a flow velocity of 40 cm/s.

Consequently, 3D TOF MRA tests show that the faster fluid velocity decreases the signal-to-noise ratio and contrast-to-noise ratio, and basically it can be determined that 3D TOF MRA is displayed larger than in the actual measurement.

Keywords : TOF angiography, fluid velocity, length of inner cavity, signal-to-noise ratio, contrast-to-noise ratio