

Time-to-Maximum (Tmax)

- Perfusion parameter used both in CT perfusion and MRI perfusion
- Reflects the time delay between the contrast bolus arriving in the proximal large vessel arterial circulation (arterial input function) and the brain parenchyma
- It is calculated by deconvoluting the arterial input function
- Although Tmax is widely used in defining tissue at risk of infarction in the setting of ischemic stroke it is susceptible to a variety of distortions particularly in the setting of inflow vascular abnormalities

Identifying Tissue at Risk

- The frequently used **Tmax** parameter with a **delay >6 seconds** provides a reasonable estimate of final infarction in patients without reperfusion.
- Tmax may also be the most concordant parameter between CTP and MRP

Arterial input function

- The arterial input function is graphically described by a time-signal intensity curve on MRI or a time-attenuation curve on CT.
- These curves are characterized by a baseline (before the arrival of the bolus), a sharp rise to the "peak" (the maximum concentration of contrast medium) followed by a slow decrease towards the baseline .
- Selection of the region of interest is critical for the correct estimation of Arterial input function and usually involves the choice of a major artery (middle cerebral artery in brain or aorta in abdomen)

Neuroimaging

- Determination and deconvolution of arterial input function curves are essential in both dynamic susceptibility MRI and CT perfusion to obtain parameters
 - Cerebral blood flow (CBF)
 - Cerebral blood volume (CBV)
 - Mean transit time (MTT)
 - Time-to-peak (TTP)
 - Time-to-maximum (Tmax)

Neuroimaging

- On the other hand in dynamic contrast-enhanced MRI, it is possible to calculate other perfusion parameters such as Ktrans (used in neuroimaging and abdominal imaging) by deconvoluting arterial input function curves.