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Fogging Effect in Strokes: Are We Aware of It?

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Abstract

Fogging effect is a transitory phenomenon of concealed cerebral infarction on computed tomography (CT). This effect is generally noticed within 2-3 weeks from the stroke onset.

CT scan is the initial diagnostic imaging tool to demonstrate Ischemic strokes and ruling out/in hemorrhage.

They usually demonstrate Hypo density on non-contrast CT scan. Iso-dense infarcts are misleading for radiologists and physicians as they might be interpreted as normal in spite of a clinically suspected stroke. Fogging reported to be seen in about 50% of the ischemic strokes.

Knowledge of this effect is crucial to avoid misinterpretation or underestimation of this important finding and my guide further management especially if anticoagulants are being considered.

Keywords: Diagnostic tool; Imaging; CT scan; Ischemic strokes; Brain CT

Introduction

The fogging effect was first described in 1979 by Becker et al. [1]. It is defined as transient density equalization of the area of infarcted cerebral parenchyma in reference to normal parenchyma during the sub-acute phase of the infarct [2].

Case Study

This is a typical rare phenomenon. CT scan is the method of choice to monitor the evolution of infarcts. In the hyperacute phase, initial brain CT scans may be normal and is usually performed to exclude other potential causes of patient's symptoms.

During the acute phase, the infarct will appear as an area of cortical hypodensity, blurring/loss of gray white matter differentiation, gyral swelling, and might causes mass effect (**Figure 1**).

Sub-acute to chronic phase of the infarct usually demonstrates progressive lower attenuation till it becomes CSF density that reflects tissue death and necrosis (**Figures 2 and 3**) [3,4].

The transient normalization of the CT scan during the sub-acute phase is attributed to migration of lipid-laden macrophages into the infarcted tissue, proliferation of the capillaries and redistribution of edema (**Figure 2**) [5].

This phenomenon has been also described on T2 WI and presumed to be due the same pathophysiological process as it occurs in the same time frame [6].

Figure 1 Initial non-contrasted CT scan of the brain, which demonstrates transcortical right parietal lobe infarct.

Figure 2 Two weeks (2) later, non-contrasted CT of the head demonstrated fogging of right parietal lobe infarct.

Figure 3 Six (6) months later, fogging of right parietal chronic infarction.

Discussion

Dekeyzer et al. had described normalization of the immediate post-interventional CT scan. Given the short interval between pre-and post-interventional CT scan it is unlikely to be resulted from the afro mentioned physiological process. Dekeyzer et al. self-assumed it could be sequele of contrast leak due to disruption of blood brain barrier [7].

During the first week following a cortical infarct hypo-attenuation and swelling become more marked resulting in significant mass effect and clear demarkation of the infarct with vivid gyral enhancement usually seen at this time.

As time goes on the swelling starts to subside and the cortex begins to increase in attenuation. This is believed to occur as the result of migration into the infarcted tissue of lipid-laden macrophages as well as proliferation of capillaries, and decrease in the amount of oedema [1-3]. After 2 to 3 weeks following an infarct the cortex regains near-normal density and imaging at this time can lead to confusion or missed diagnosis [4,5]. Fogging has been demonstrated in around 50% of cases.

Although this phenomenon has been described before, it remains a source of confusion for radiology residents, general radiologist and neurologist especially in the emergency setting and absence of prior infarct imaging.

Conclusion

In conclusion, fogging of the subacute ischemic infarct is a temporary imaging phenomenon that masks a serious finding, which needs to be kept in mind when strokes are being worked up.

Knowledge about this effect and awareness are of paramount importance as they minimize the risk of underestimating strokes and compromising patient care.

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