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Application of deep learning for early diagnosis of severe cutaneous adverse drug reactions
重症薬疹早期画像診断へのディープラーニングの応用

【Keywords】

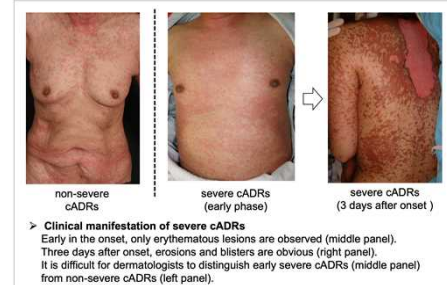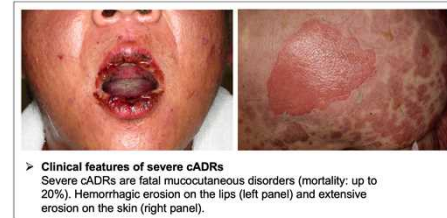| Severe cutaneous adverse drug reactions	Diagnostic imaging	Deep learning	Neural network	skin disease

■Summary

・We developed a deep convolutional neural networks (DCNN) to classify severe cutaneous adverse drug reactions (cADRs) and non-severe cADRs from individual lesion images of erythema.

・The DCNN showed higher performance in screening for severe cADRs compared to dermatologists.

		Diagnosis	
		severe cADRs	non-severe cADRs
DCNN output	severe cADRs	755	761
	non-severe cADRs	52	1832

➤ Performance of the DCNN. Sensitivity for severe cADRs: 93.6%

■Subject Details/Topic

・Severe cADRs are rare, life-threatening mucocutaneous reactions, most commonly triggered by medications, showing severe and extensive skin detachment.

・In the early stage, the skin lesion of severe cADRs may mimic non-severe cADRs. Thus, it is difficult to reach a visual diagnosis of severe cADRs especially in the early stage.

・To overcome this limitation, we develop a computer-aided diagnosis system for early-diagnosis of severe cADRs powered by a DCNN.

➤ Clinical features of severe cADRs
Severe cADRs are fatal mucocutaneous disorders (mortality: up to 20%). Hemorrhagic erosion on the lips (left panel) and extensive erosion on the skin (right panel).

non-severe cADRs / severe cADRs (early phase) / severe cADRs (3 days after onset)

➤ Clinical manifestation of severe cADRs
Early in the onset, only erythematous lesions are observed (middle panel). Three days after onset, erosions and blisters are obvious (right panel). It is difficult for dermatologists to distinguish early severe cADRs (middle panel) from non-severe cADRs (left panel).

○Advantages

・Deep learning applications for skin diseases are limited to imaging of skin tumors. Application to inflammatory skin diseases is a new technology. (Japanese Patent Application 2019-148101)

・All images with correct answers were annotated by dermatologists.

○Applications

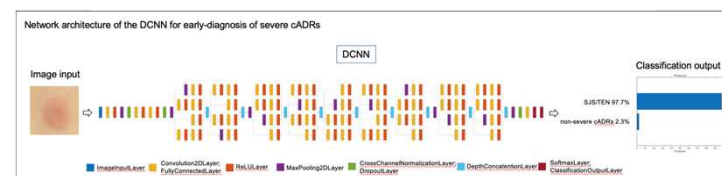・If a general practitioner can detect early severe cADRs by usisng our DCNN, the prognosis of patients can be greatly improved.

○Plans

・Build applications and install them in digital cameras or electronic medical record.

■We hope to collaborate with…

・The software vendor, or the manufacturer of imaging and optical products including cameras and medical equipment.