Artificial Intelligence in TACE: Predictive Modeling for Patient Outcomes and Treatment Response

THE OHIO STATE UNIVERSITY COLLEGE OF MEDICINE

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Background

Transarterial chemoembolization (TACE) TACE is a minimally invasive procedure that directly delivers chemotherapy to a liver tumor and then blocks its blood supply to trap the drugs inside.

Accurately determining the optimal patient-specific treatment strategy remains a significant challenge in the delivery of Transarterial Chemoembolization (TACE) in the treatment for Hepatocellular Carcinoma (HCC).

Recent advances have shown that artificial Intelligence (AI) algorithms developed from clinical, imaging, and laboratory data can predict treatment response and short-term survival.

Purpose: This exhibit explores AI's use as both a prognostic tool and predictor of therapeutic efficacy.

Methods

A review was performed using PubMed, MEDLINE, and Embase. Keywords included combination of "HCC", "AI" "TACE" "machine learning" (ML), and/or "deep learning" (DL). Consideration was given to ML in exploring recurrence of HCC in liver transplant. AI models like DSA Net, EfficientNetv2 , and others were used to highlight the use of AI in TACE.

Results

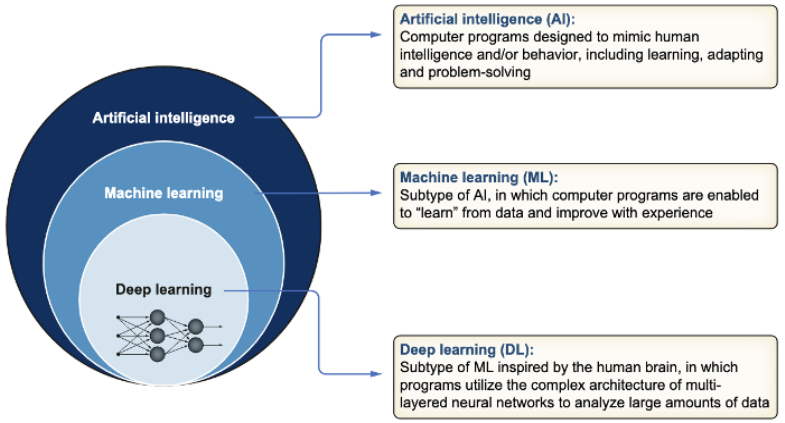

Figure 1 : Adapted from Calderaro et al. Definitions of artificial intelligence (AI), machine learning (ML) and deep learning (DL)

Results (cont'd)

- Zhang et al. showed that of AI's DL architecture on Digital Subtraction angiography (DSA-Net) for tumor segmentation predicted treatment response to first TACE with an accuracy of 78.2%.
- Peng et al 's ML model based on pyradiomics features from 3D CT indicated that patients with high pyradiomics scores had good progression-free survival (PFS) and overall survival (OS) (both P<0.001).

Conclusion

Artificial intelligence, an emerging tool in medicine, has the potential to transform TACE by enhancing predictive modeling through integrated data analysis. While early results are promising, further research is needed to standardize datasets and improve the generalizability and interpretability of AI-driven models. HCC.

Model	Data Type	Key Outcomes	Performance
DSA-Net	Angiography (DSA)	Tumor segmentation → TACE response	Acc: 78.2%, Sn: 77.6%, Sp: 78.7%
Pyradiomics	CT (3D)	PFS & OS prediction	P<0.001 (better survival in high-score group)
EfficientNetV2	CT/MRI images	OS prediction	38.8 vs 20.9 mo. (vs. radiomics)
MRI-ML	MRI + Clinical	Recurrence before transplant	Improved accuracy vs. clinical alone

Figure 2 : Side by side model comparison

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