論　文　内　容　の　要　旨
Synopsis of Thesis

氏　　名 Name	矢野　弘樹
論文題名 Title	Unenhanced CT as an Alternative to Contrast-Enhanced CT in Evaluating Renal Cryoablation Zones (小径腎細胞癌への凍結療法後早期における造影CTによる凍結範囲評価に対しての単純CTによる代替的評価の有用性)

論文内容の要旨

Background: Advancements in imaging technology and the increased use of abdominal imaging have increased the detection of renal cell carcinoma (RCC). Computed tomography (CT)-guided cryoablation offers advantages concerning spatial resolution and real-time visualization during the procedure. Post-procedure imaging is crucial for assessing treatment adequacy, and contrast-enhanced CT (CE-CT) is generally considered essential. However, many patients, particularly older patients, experience renal dysfunction, which could preclude contrast agent use. Therefore, unenhanced CT (UE-CT) is ideal for post-procedural evaluation. This study investigated the utility of UE-CT in evaluating cryoablation zones as an alternative to CE-CT.

Materials and Methods: This retrospective study included 54 patients (58 tumors) who underwent cryoablation at a single institution between 2014 and 2024. Patients with available early follow-up CT (within 3 days after cryoablation) who underwent follow-up were included. Renal cryoablation was performed percutaneously under CT fluoroscopy. CT attenuation values were evaluated for pre-procedure UE-CT (kidneys, tumor), post-procedure UE-CT (kidneys, cryoablation zone, tumor), and post-procedure CE-CT (kidneys, cryoablation zone, tumor). Tumor volumes were evaluated for post-procedure regions on both UE-CT and CE-CT.

Results: On CE-CT, the median attenuation values differed between the normal kidneys and cryoablation zone (171.7 HU vs. 55.7 HU, $P < 0.0001$). On UE-CT, the median attenuation values also differed between the normal kidneys and cryoablation zone (34.3 HU vs. 47.4 HU, $P < 0.0001$). The median renal volumes of the unenhanced regions on CE-CT and those with attenuation changes in UE-CT were not significantly different (26.52 cm3 vs. 28.83 cm3, $P = 0.86$). These values were highly correlated ($r = 0.95$; 95% confidence interval = 0.91-0.97).

Conclusion: This study demonstrated that UE-CT can provide a reasonable estimation of the ablation zone in patients with RCC following cryoablation. Although the contrast between the ablation zone and normal renal parenchyma was lower on UE-CT than on CE-CT, the ablation zone was detectable and highly correlated with that on CE-CT.

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論文審査の結果の要旨及び担当者

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論文審査の結果の要旨

腎細胞癌の診断において、画像技術の進歩により、CT誘導下凍結療法が空間分解能と術中のリアルタイム視覚化の点で有利な治療法として注目されている。従来、治療効果の評価には造影CTが不可欠とされてきたが、特に高齢患者では腎機能障害により造影剤の使用が制限される場合が多い。本研究では、54名の患者（58腫瘍）を対象に、凍結療法後の評価における単純CTの有用性を検討した。その結果、造影CTでは正常腎組織と凍結部位のCT値に明確な差異が認められ（171.7 HU vs. 55.7 HU, $P < 0.0001$）、単純CTにおいても同様の差異が確認された（34.3 HU vs. 47.4 HU, $P < 0.0001$）。さらに、両者の凍結部位の体積測定値には高い相関が認められ（$r = 0.95$）、単純CTによる評価が造影CTの代替となり得ることが示された。本研究は、腎機能障害を有する患者に対しても安全かつ効果的な治療後評価を可能にする重要な知見を提供しており、博士（医学）の学位授与に値すると考えられる。