

Differential diagnosis of soft tissue tumours by using semi-quantitative and quantitative parameters of dynamic contrast-enhanced magnetic resonance imaging

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Aims and objectives

of dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) in differentiating benign and malignant soft tissue tumours.

Methods and materials

Totally 45 patients with pathologically confirmed soft tissue tumours (15 benign tumours and 30 malignant tumours) underwent DCE-MRI. The semi-quantitative parameters were as follows: time to peak (TTP), (MAX Conc.), area under curve of time-concentration curve (AUC-TC), and maximum rise slope (MAX Slope). Quantitative DCE-MRI was analysed with the Extended Tofts-Kety model to obtain the following quantitative parameters: K_{trans} , K_{ep} , and V_e . Data were evaluated using the independent t test or Mann-Whitney U test analysis and receiver operating characteristic (ROC) curves. The following groups of tissues were compared: benign tumours and normal tissues, malignant tumours and normal tissues, benign tumours and malignant tumours, and benign control groups and malignant control groups.

Results

In benign tumours, significant differences existed in MAX Conc. ($p=0.000$), AUC-TC ($p=0.000$), MAX Slope ($p=0.000$), Ktrans ($p=0.000$), Kep ($p=0.000$) and Ve ($p=0.001$) between the lesion and control groups. In malignant tumours, significant differences existed in TTP ($p=0.000$), MAX Conc. ($p=0.000$), AUC-TC ($p=0.000$), MAX Slope ($p=0.000$), Ktrans ($p=0.000$), Kep ($p=0.000$), and Ve ($p=0.000$) between the lesion and the control groups. There were significant differences in MAX Conc. ($p=0.000$), AUC-TC ($p=0.000$), MAX Slope ($p=0.000$), Ktrans ($p=0.000$), and Kep ($p=0.003$) between benign soft tissue tumours and malignant soft tissue tumours. The AUC of the ROC curve demonstrated the diagnostic ability of MAX Conc. (0.849), AUC-TC (0.831), MAX Slope (0.847), Ktrans (0.836) and Kep (0.778). No semi-quantitative or quantitative parameter showed a significant difference between the benign control and malignant control group.

Images for this section:

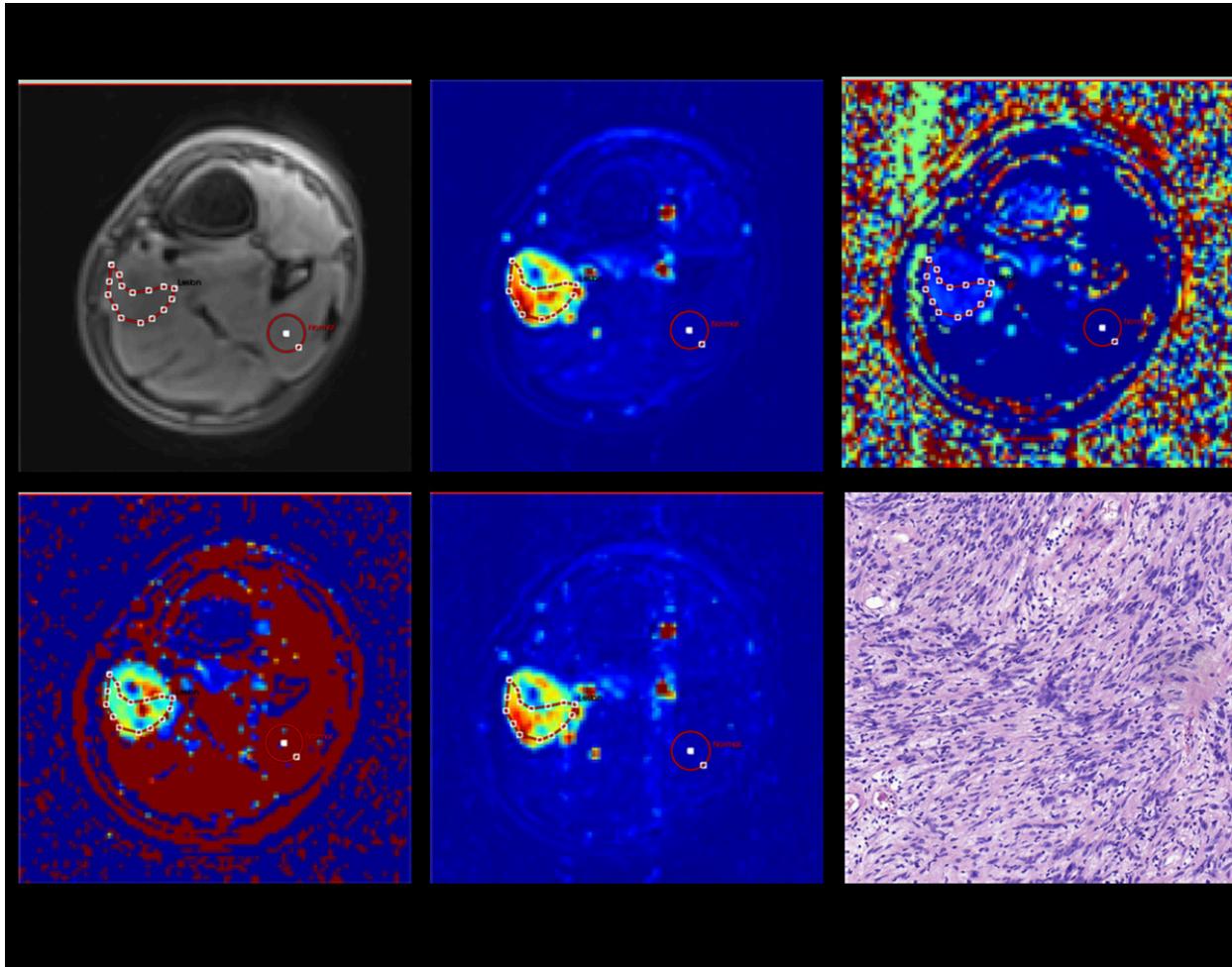


Fig. 1: A 30-year-old male with benign soft-tissue tumours (schwannoma) in lower extremity. a: Contrast-enhanced image with the outlined as the region of interest(ROI) and the normal muscle tissue. b-e: Pseudo-color images of Ktrans, Kep, Ve and MAX Slope, respectively. Values for Ktrans, Kep, Ve and MAX Slope from the ROIs were 0.068 ± 0.016 , 0.144 ± 0.036 , 0.496 ± 0.160 , 0.629 ± 0.151 , respectively. f: Histopathology examination (H&E, 200x).

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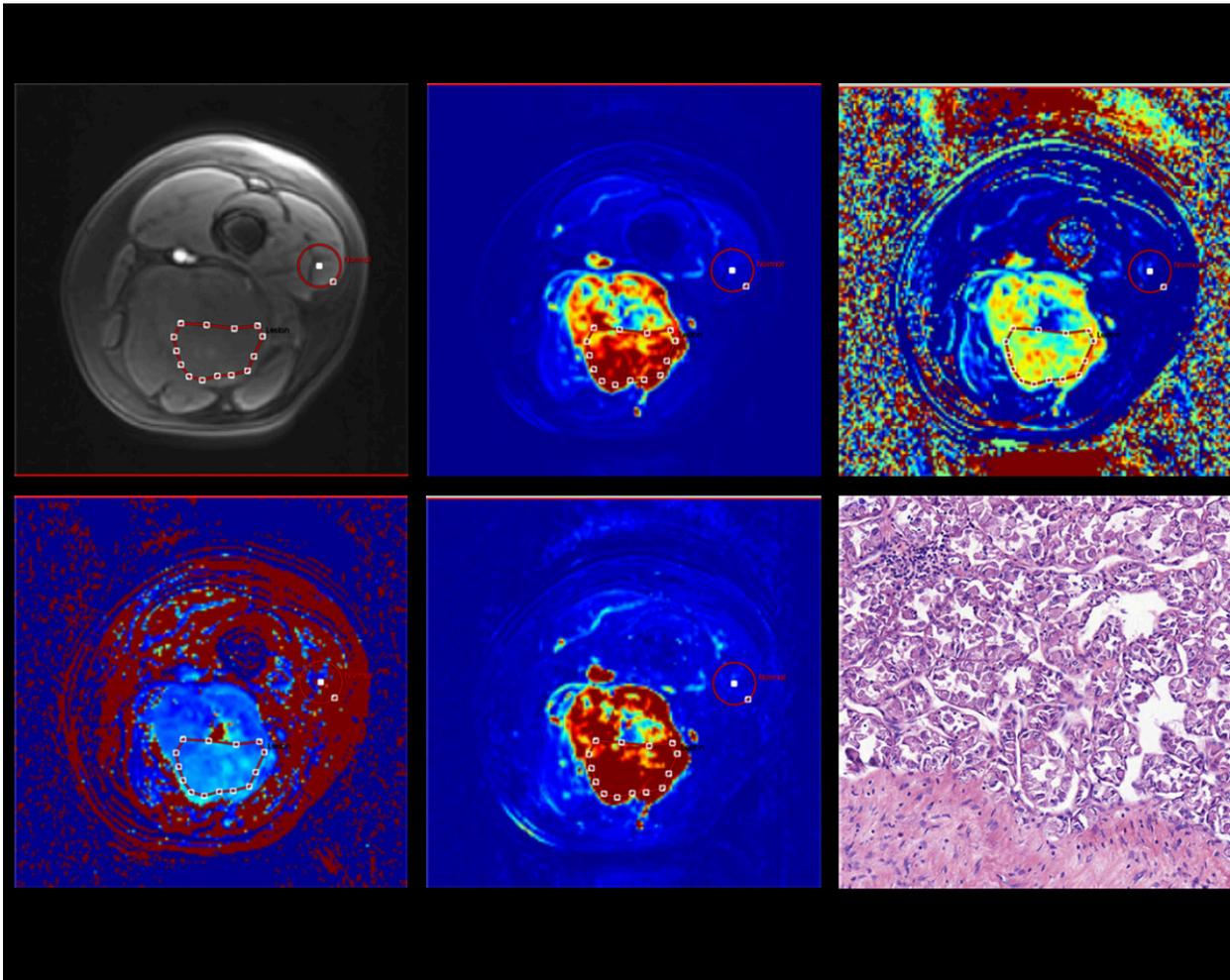


Fig. 2: A 26-year-old woman with malignant soft-tissue tumours (alveolar soft part sarcoma) in lower extremity. a: Contrast-enhanced image with the outlined as the region of interest(ROI) and the normal muscle tissue. b-e: Pseudo-color images of Ktrans, Kep, Ve and MAX Slope, respectively. Values for Ktrans, Kep, Ve and MAX Slope from the ROIs were 0.140 ± 0.029 , 0.554 ± 0.103 , 0.351 ± 0.035 , 1.256 ± 0.392 , respectively. f: Histopathology examination (H&E, 200x).

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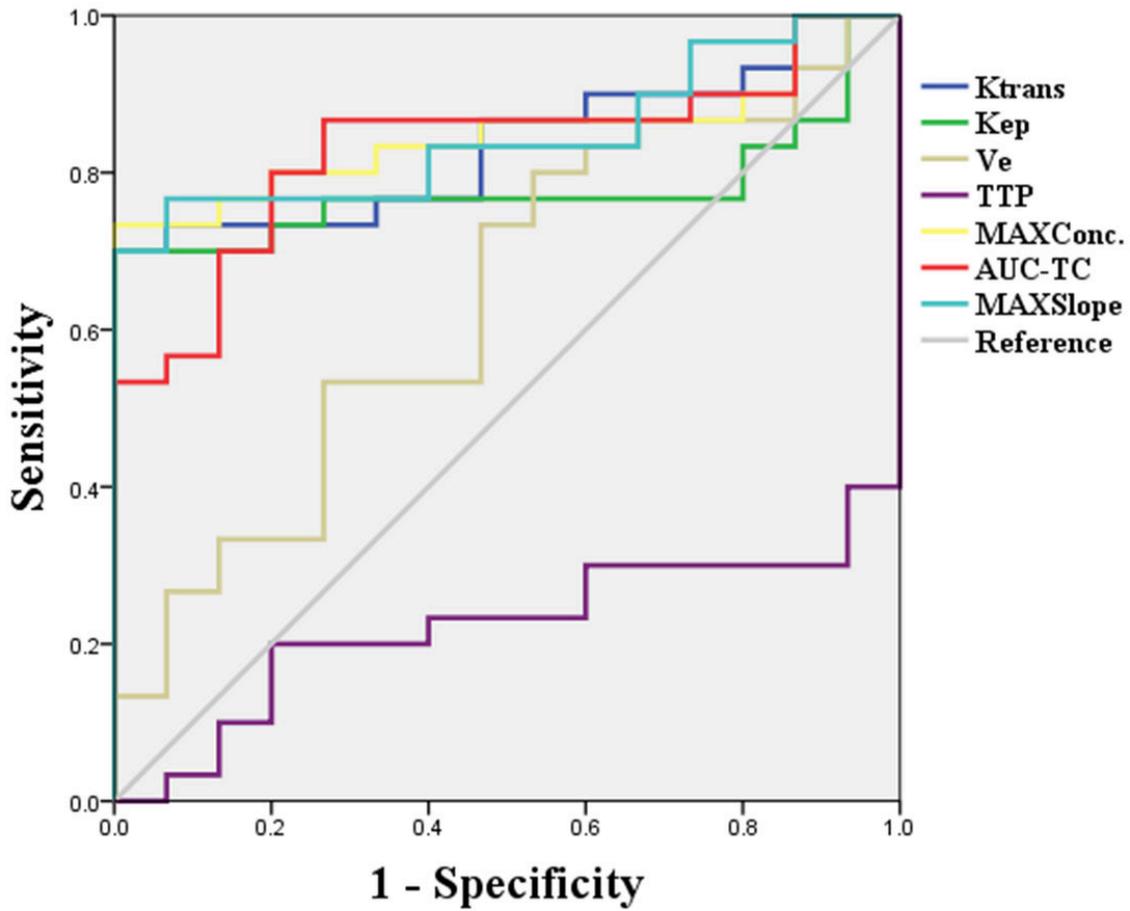


Fig. 3: The ROC curves of TTP, MAX Conc., AUC-TC, MAX Slope, Ktrans, Kep and Ve in the differentiation between benign and malignant soft-tissue tumours.

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Conclusion

The semi-quantitative and quantitative parameters of DCE-MRI provided the ability to differentiate between benign and malignant soft tissue tumours. The values of MAX Conc., AUC-TC, MAX Slope, Ktrans, and Kep were higher in malignant tumours than in benign tumours. The use of TTP and Ve values in differentiating between benign and malignant soft tissue tumours needs further study.

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