

# A Study of Differentiation between Prostate Cancer and Prostatitis by 1H MR Spectroscopic Imaging (MRSI)

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**Purpose:** To investigate the differential features of prostate cancer and prostatitis by 3D <sup>1</sup>H MR Spectroscopic Imaging (MRSI)

## Introduction

Metabolite ratios of CC/C [(Choline+Creatine)/Citrate] has been accepted as a metabolic marker for prostate cancer in peripheral zone (1-2). However, benign changes such as prostatitis also show abnormal spectra with higher CC/C ratio. Whether this ratio can be reliably used to differentiate malignant tumor from prostatitis remains controversial.

## Methods

Seventy-two voxels corresponding to the histopathologically confirmed regions of cancer or prostatitis in the peripheral zone were retrospectively evaluated using MR Spectroscopic Imaging. All studies were performed on a 1.5 Tesla GE Signa Twin-speed with ExciteII. MR clinical scanner using the body coil for RF transmission and an endorectal coil (Medrad) in combination with ATD torso coil for signal reception. Proton spectra were collected from throughout the prostate using PRESS volume selection with 3D phase encoding (16x8x8) and VSS pulses. Spectral data were aligned with the MR imaging data using Functool provided by GE. Cancerous voxels were defined as CC/C greater than 0.8. The changes in citrate and choline were evaluated by taking a ratio of citrate and choline in regions with prostatitis and healthy peripheral zone of prostate within the same study. Regions of healthy, prostatitis and malignant prostate tissue were histologically confirmed by biopsies.  $\chi^2$  test was applied to determine the power of CC/C ratio in differentiation of prostate cancer and prostatitis.

## Results and discussion

The CC/C for cancer voxels (1.276±0.41) was significantly different from the ratios in the voxels with prostatitis (1.028±0.40,) (p<0.05) due to greatly increased choline levels in the cancer voxels. When CC/C of 0.8 was taken as the criteria, the sensitivity, specificity, and accuracy were 65.5%, 71.4% and 66.7%, respectively. PPV and NPV were 90.5% and 33.3% in this study (Table). MR spectral data showed higher CC/C (greater than 0.8) in 66.7% (20 out of 30) voxels with prostatitis predominantly due to elevated choline levels. Furthermore, when we applied citrate level (Cit/Norm.Cit=0.75) as additional criteria to evaluate the region of prostatitis, the overestimation was significantly reduced to 26.6% (8 out of 30 voxels) ( Fig1)

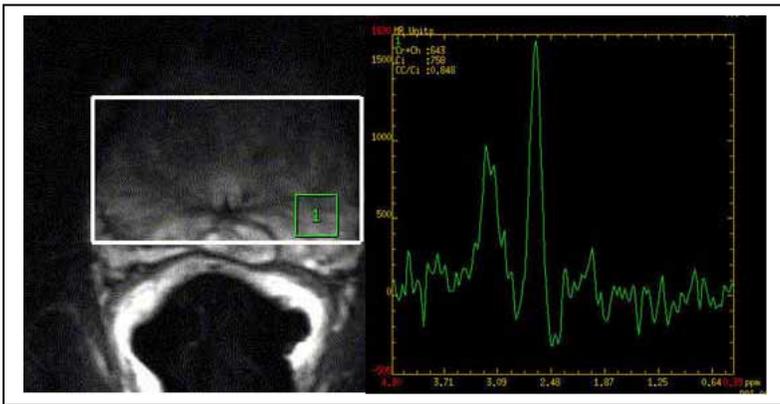


Fig 1, The spectra from the histopathologically confirmed regions of prostatitis demonstrated elevated CC/C (>0.8), no obviously reduced citrate level was observed.

	CC/C<0.8 (# of voxels)	CC/C≥0.8 (# of voxels)
prostatitis	10	20
cancer	4	38

Several studies have addressed that combined Magnetic Resonance Imaging (MRI) and MR Spectroscopic Imaging ( MRSI ) may play an important role in detection and staging of prostate cancer. However, there was significant overlap of the CC/C ratios in rather amount of voxels for individual patients with cancer and prostatitis. Our preliminary study shows that metabolic changes in the pathologically confirmed regions of prostatitis may mimic the features in cancer with elevated choline which caused overestimation of cancer. This result was concordance with the reports in the literature, the spectral data of 75% patients ( 9 out of 12 ) with chronic prostatitis in Shukla-Dave's study correlated with metabolic abnormality suggestive of prostate cancer (3). Additionally, we observed 73.3% voxels with prostatitis demonstrated normal or slightly reduced citrate which may different from that in cancer voxels. This findings might attribute to the facts of that normal metabolism may exist in part of inflammatory tissues.

## Conclusion

The metabolic ratios of CC/C can be used to differentiate tumor from benign prostatitis, the overestimation of cancer for prostatitis was significantly reduced by adding the requirement that citrate was not or slightly decreased relative to normal level citrate (Cit/nom. Cit≥0.75)

## References

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