

# Dynamic contrast-enhanced MR imaging of uterine cervical cancer: pharmacokinetic analysis with histologic correlation and its prognostic significance after radiation therapy

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## Purpose

It has been shown that dynamic MR imaging of cervical cancer may predict tumor control with radiation therapy. This study investigated pathologic and pharmacokinetic basis of different enhancement patterns on dynamic MR imaging with advanced cervical cancer by correlating imaging findings with histopathologic findings and results of radiation therapy.

## Methods and Materials

The correlation between dynamic MR imaging of advanced uterine cervical cancer and pathologic findings was evaluated in 22 females who underwent hysterectomy. Forty patients who were treated by radiation therapy also underwent dynamic MR imaging.

MR imaging was performed with a 1.5-T system with a phased array coil. After T2-weighted fast spin-echo (FSE) imaging with a TR of 4500 msec, TE of 120 msec, and an echo train length of 15. Dynamic MR imaging was employed with use of a fast spin echo technique with TR of 340 msec, a TE of 12 msec, and an echo train length of 3. Five sections were obtained with a multi-planar technique. Actual sampling time was 60 seconds. The field of view of 175X200 mm, a 114 x 256 matrix, and a section thickness of 5 mm were chosen for both dynamic and T2-weighted FSE images. After a rapid hand injection (2 ml/sec) of gadopentetate dimeglumine (0.1 mmol/kg; Magnevist), dynamic MR images were obtained every 30 seconds for 4 minutes. Signal intensity changes versus time were analyzed by using a pharmacokinetic model proposed by Tofts et al. All imaging findings were correlated with histopathologic findings and immunohistologic findings.

## Results

The proportion of cancer cell fascicles and that of interstitial tissues affected contrast enhancement of cervical cancers on dynamic-enhanced perfusion MR images. Areas showing intense enhancement ( $K=30 \times 10^{-3}$ ) predominantly composed of cancer cell fascicles, while areas with slight degree of enhancement ( $K=21 \times 10^{-3}$ ) were composed of fibrous tissue. This intense enhancement was predominantly seen in the periphery of the tumor, while less-enhanced area was seen in the center of the tumor.

In correlating the dynamic MR imaging pattern with radiation therapy results, the disease free period in patients with predominantly less enhancing area on dynamic study was significantly shorter than those with predominantly well-enhanced area.

## Conclusion

These preliminary results suggest that dynamic MR studies before therapy can offer important information on microinvolvement of the cervical cancer. Predominance of areas of high tumor perfusion suggested predominantly cancer cells. Areas of poorly perfused area composed of fibrous tissue. Radiation therapy appears to be effective in tumors with areas of high tumor perfusion.