

# The Value of Cystoscopy and Intravenous Urography after Magnetic Resonance Imaging or Computed Tomography in the Staging of Cervical Carcinoma

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The clinical staging system for cervical carcinoma presently recommended by the International Federation of Gynecology and Obstetrics (FIGO) does not include MRI or CT findings and thus suffers limited accuracy. Recently however, the positive contributions of MRI and CT to preoperative staging have been reported. This study involves a determination of the value of routine cystoscopy and intravenous urography, in the detection of bladder invasion or hydronephrosis resulting from cervical carcinoma, among patients who had undergone MRI or CT. Among a total 296 patients with cervical carcinoma, 271 patients (92%) had undergone MRI and 25 (8%) CT. Bladder invasion was identified pathologically by cystoscopic biopsy in 8 (57%) of the 14 patients with suspected bladder invasion on MRI or CT. There was no bladder invasion in any of the other cases lacking in bladder invasion evidence on MRI or CT. Hydronephrosis was identified by intravenous urography in 18 patients, as it also was in all of these cases on MRI or CT, confirming a negative predictive value for MRI or CT, in detecting bladder invasion or hydronephrosis from cervical carcinoma, of 100%. Therefore, although MRI or CT cannot totally replace cystoscopy, the latter is unnecessary in the absence of bladder invasion evidence on MRI or CT. Intravenous urography, however, can be safely omitted whenever MRI or CT is performed.

**Key Words:** Cervical carcinoma, staging, cystoscopy, intravenous urography, magnetic resonance imaging

## INTRODUCTION

Traditional pretreatment evaluation of patients with cervical carcinoma has included physical examination, chest radiography, cystoscopy, intravenous urography, sigmoidoscopy, and barium enema. However, previous studies have shown that clinical staging is often inaccurate, with staging errors reported as occurring in 34 - 39% of cases.<sup>1,2</sup> The inclusion in the staging workup of computed tomography (CT) or magnetic resonance imaging (MRI) has been advocated in order to improve the accuracy of staging for cervical carcinoma.<sup>3,4</sup>

Until now, cystoscopy and intravenous urography have been routinely included in the staging workup for the detection of bladder invasion or hydronephrosis from cervical carcinoma. However, with the advent of CT or MRI, the routine use of cystoscopy and intravenous urography in pretreatment evaluation has been called into question.

The purpose of this study was to determine the clinical value of routine cystoscopy and intravenous urography for the detection of bladder invasion or hydronephrosis from cervical carcinoma in patients who had already undergone MRI or CT.

## MATERIALS AND METHODS

The subjects enrolled in the study comprised

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296 consecutive patients with pathologically proven cervical carcinoma, seen at Ajou University Hospital between June 1995 and December 2000. The patients' ages ranged from 28 to 89 years (mean, 51.9 years). Routine clinical staging work-up included physical examination, chest radiography, intravenous urography, cystoscopy, proctoscopy, barium enema, and MRI. MRI was not performed in 25 patients who had already undergone CT in another hospital before transferring to our hospital. Clinical staging was based on the International Federation of Gynecology and Obstetrics (FIGO) staging classification.<sup>5</sup>

Rigid cystoscopy was performed by an urologist under local anesthesia using a 17.5-F Wolf cystoscope. Bladder biopsies were performed in all patients who had bullous edema, a large mass elevating the bladder, or obvious cervical carcinoma invasion.

In patients with hydronephrosis evident on either intravenous urography, MRI or CT, retrograde pyelography was performed to evaluate the ureteral obstruction, and if such an obstruction was identified, a ureteral double J stent was inserted. In cases where the ureteral stent insertion failed, percutaneous nephrostomy was performed.

The cystoscopy and intravenous urography findings for each patient were compared with those from MRI and CT.

## RESULTS

Among the total 296 patients with cervical carcinoma, there were 155 stage IB patients, 28 stage IIA, 83 stage IIB, 1 stage IIIA, 13 stage IIIB, and

16 stage IV, based on the FIGO staging classification (Table 1). Among them, 278 patients (94%) had squamous cell carcinoma and 18 (6%) had adenocarcinoma, while 271 (92%) underwent MRI and 25 (8%) underwent CT.

Of the 296 patients, cystoscopic biopsy was performed in 24 patients (8%), with the suspicious areas of cervical carcinoma invasion showing bullous edema in 12 cases (50%) and a mass elevating the bladder in the other 12 (50%). Bladder invasion was confirmed pathologically in 8 cases, all of which were later proved to be squamous cell carcinoma. Bladder invasion was suspected in 14 patients, 11 on MRI and 3 on CT. All cases with biopsy-proven bladder invasion were also identified on MRI or CT (Table 1). The negative predictive value of MRI or CT in the detection of bladder invasion from cervical carcinoma was thus determined to be 100%.

Among the 296 patients, hydronephrosis was identified by intravenous urography in 18 patients (6%), all of which were also identified on MRI or CT (16 on MRI and 2 on CT). In all 18 cases, hydronephrosis with ureteral obstruction was confirmed by retrograde pyelography. Therefore, the negative predictive value of MRI or CT in hydronephrosis detection from cervical carcinoma was also confirmed to be 100%. Of these 18 patients, 16 underwent insertion of ureteral double J stent and 2 underwent percutaneous nephrostomy (Table 2).

## DISCUSSION

Accurate staging for cervical carcinoma is crucial in determining the mode of therapy. The

**Table 1.** Results of Staging Workup for Bladder Invasion in Cervical Carcinoma Patients

Clinical stage	No. cases	Cystoscopic biopsy No.	Cystoscopic findings		Bladder invasion on MRI or CT	Biopsy-proven bladder invasion
			Bullous edema	Mass elevating bladder		
IB	155	4	4	0	0	0
IIA	28	0	0	0	0	0
IIB	83	7	3	4	1	0
IIIA	1	0	0	0	0	0
IIIB	13	3	1	2	2	0
IV	16	10	4	6	11	8
Total	296	24	12	12	14	8

**Table 2.** Results of Hydronephrosis Evaluation and Its Management in Cervical Carcinoma Patients

Clinical stage	No. cases	IVU	MRI or CT	Ureteral stent	PCN
IB	155	0	0	0	0
IIA	28	0	0	0	0
IIB	83	0	0	0	0
IIIA	1	0	0	0	0
IIIB	13	9	9	9	0
IV	16	9	9	7	2
Total	296	18	18	16	2

IVU, intravenous urography; PCN, percutaneous nephrostomy.

clinical staging recommended by the FIGO has its limitations and is often inaccurate, primarily due to difficulties in evaluating the parametria, pelvic sidewalls, uterine corpus, and pelvic and periaortic lymph nodes, as well as the size of endophytic tumors.<sup>6,7</sup> However, the FIGO clinical staging system still does not include CT or MRI among its routine tests because they are not generally available and because of variability in the interpretation of their results.<sup>5</sup>

Both CT and MRI have been advocated for the staging of cervical carcinoma, and are widely accepted as the most reliable imaging modalities in such preoperative staging.<sup>3,4,6-13</sup> In comparison with surgical staging, the accuracy resultant from MRI staging was found to be 77-90%, and that for CT 63-80%.<sup>6,14,15</sup> MRI was superior to CT in the evaluation of tumor size, parametrial invasion, and the local and regional extent of disease in pre-treatment imaging for cervical carcinoma.<sup>4,6,14-16</sup> The advantage of MRI results from its capability to investigate an organ in any desired plane. Meanwhile CT, limited to measurement in one plane only, has reduced usefulness in terms of image morphology for assessing the degree of infiltration into neighboring anatomical structures, especially the bladder and rectum.<sup>10,11,14-17</sup> Hricak et al.<sup>18</sup> have suggested that although MRI is expensive, it actually results in net cost savings (cost minimization) due to its reliability and ability to replace a number of less-expensive procedures such as barium enema, cystoscopy and proctoscopy.

In our hospital, MRI has been included as a routine preoperative evaluation procedure for cervical carcinoma since 1995, except in the case

of patients who had already undergone CT in another hospital before transferring to our hospital. We found that some cervical carcinoma patients, who had already undergone MRI or CT, did not need cystoscopy or intravenous urography in the preoperative staging workup. In this study, bladder invasion was identified pathologically by cystoscopic biopsy in 8 (57%) of 14 patients with suspected bladder invasion on MRI or CT. No cases of bladder invasion occurred without evidence on MRI or CT, confirming a negative predictive value for MRI or CT in bladder invasion detection of 100%. Therefore, cystoscopy was demonstrated to be unnecessary in the absence of bladder invasion evidence on MRI or CT. The results of our study agree with those reported by Liang et al.<sup>19</sup> and Sundborg et al.,<sup>20</sup> which also suggested that cystoscopy is unnecessary in patients presenting no evidence of bladder involvement on CT. Hricak et al.<sup>7</sup> also reported that MRI may eliminate the need for cystoscopy in most patients with cervical carcinoma because tumor extension to the bladder can be reliably excluded by MR imaging. However, they did suggest that cystoscopy should be performed when MRI or CT findings regarding bladder involvement are equivocal.

Although the relationship between hematuria and cervical carcinoma was not evaluated in this study, hematuria may result from bladder invasion in cases of cervical carcinoma. Therefore, cystoscopy may still be required to rule out bladder invasion in cases with hematuria. In this regard, Therattil and Rao<sup>21</sup> reported that only 4% of stage III disease patients with microscopic hematuria actually manifested bladder mucosal

invasion, and that in the other 96% of cases the microscopic hematuria was due to cystitis, as proven by co-existent pyuria and positive urine cultures. This result establishes that microscopic hematuria is an unreliable indicator of bladder invasion. Furthermore, in consideration of the urine contamination possible from cervical carcinoma bleeding which may be contained in vaginal secretion, further study with catheterized urine may be helpful in clarifying whether cystoscopy is needed or not in hematuria cases. However, because all cases in our results with biopsy-proven bladder invasion were recognized on MRI or CT and given that there was no bladder invasion in any cases at clinical stages III or less, cystoscopy may even be unnecessary in cases with hematuria in the absence of bladder invasion on MRI or CT.

Ureteral obstruction is one of the major prognostic variables in cervical carcinoma and intravenous urography has been routinely included in preoperative evaluation in order to identify hydronephrosis with ureteral obstruction. Hydronephrosis due to ureteral obstruction is caused by direct cancer invasion of the ureter or by lymph node enlargement. In this study, hydronephrosis was identified by intravenous urography in 18 patients, as it also was for all 18 on MRI or CT, confirming a negative predictive value for MRI or CT in detecting hydronephrosis from cervical carcinoma of 100%. Therefore, intravenous urography can safely be omitted in the staging workup of cervical carcinoma in all patients who have undergone MRI or CT. The results of our study agree with those reported by others, which demonstrated that the accuracies of intravenous urography, CT, and MRI in the detection of urinary obstruction are similar and that intravenous urography is not indicated when CT or MRI has been performed.<sup>18,22,23</sup> MRI and CT also have the advantage over intravenous urography in being able to identify the cause as well as the level of obstruction in the ureter.

In this study, the value of proctoscopy and barium enema in the detection of rectal invasion, among patients for whom CT or MRI had been performed, was not evaluated. However, it is possible that MRI can also replace proctoscopy and barium enema in the majority of cases.

Therefore, although MRI is expensive, it has the advantage of being able to replace several less-expensive but more invasive procedures such as cystoscopy, intravenous urography, and possibly even proctoscopy and barium enema, a finding in agreement with that of previous studies by Hricak et al.<sup>4,18</sup>

In conclusion, in the preoperative evaluation of cervical carcinoma, cystoscopy is not necessary in the absence of bladder invasion evidence on MRI or CT, although MRI and CT cannot totally replace cystoscopy. Furthermore, intravenous urography can be omitted in all cases when MRI or CT is performed.

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