

An Evaluation of Intravenous Urography for Staging Carcinoma of the Uterine Cervix

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Abstrak

Telah dilakukan pemeriksaan urografi intravena di Bagian Radiologi Rumah Sakit Dr. Cipto Mangunkusumo/Fakultas Kedokteran Universitas Indonesia pada 174 penderita karsinoma serviks uterus sebelum pengobatan, yang telah terbukti secara patologi anatomik dan dikirim dari Bagian Obstetri dan Ginekologi Rumah Sakit yang sama, selama periode 2 Januari 1990 sampai 31 Desember 1990. Stadium klinik penyakit sebelum pemeriksaan urografi intravena terbanyak berada pada stadium III, yaitu 83 penderita (47,8%). Dari seluruh penderita, 10 kasus (5,7%) menunjukkan kelainan gambaran urogram oleh sebab lain. Dari 164 kasus yang diamati, sebanyak 33 kasus (20,1%) mengalami obstruksi traktus urinarius. Terdapat hubungan yang bermakna ($p < .01$) antara obstruksi traktus urinarius dengan makin lanjutnya stadium penyakit. Mengenai derajat obstruksi traktus urinarius, didapatkan 3 kasus (18,2%) derajat I-II dan 27 kasus (81,8%) derajat III-IV. Tempat obstruksi traktus urinarius paling banyak terjadi di ureter 1/3 distal yaitu pada 31 kasus (94%). Sekalipun tidak terdapat perbedaan yang bermakna antara stadium klinik tanpa pemeriksaan urografi intravena dan dengan pemeriksaan tersebut, namun ada kecenderungan bahwa pemeriksaan ini dapat menemukan stadium klinik yang lebih lanjut. Dengan demikian disimpulkan bahwa pemeriksaan traktus urinarius dengan urografi intravena dapat membantu menegakkan stadium klinik penderita karsinoma serviks uterus.

Abstract

From January 2 through December 31, 1990, a total of 174 patients with histopathologically confirmed cervical carcinoma referred by the Department of Obstetrics and Gynecology, Dr. Cipto Mangunkusumo Hospital/Faculty of Medicine, University of Indonesia, to the Department of Radiology of the same hospital underwent routine intravenous urography before treatment. Most of the cases were in Stage III at the time intravenous urography was performed (83 cases, 47.8%). Among the 174 cases examined, 131 (75.2%) were free from urinary tract obstruction, while 10 (5.7%) had obstructions due to factors other than malignancy, and 33 (18.9%) had obstructions caused by cervical carcinoma. There was a significant relationship ($P < .01$) between the frequency of urinary tract obstruction and the stage of the disease. Six cases (18.2%) had Grade I-II and 27 (81.8%) Grade III-IV urinary tract obstructions. The site of the obstruction in 31 cases (94%) was in the distal third of the ureter. There was a slight tendency towards upstaged assessments when the additional data from urography was available. While data from this study did not show statistically significant differences in staging, the additional data was nevertheless considered clinically useful.

Keywords : Uterine cervix carcinoma, Urinary tract obstruction, Intravenous urography

INTRODUCTION

In the developing countries, including Indonesia, cervical carcinoma has the highest incidence.^{1,2} The Department of Health of the Republic of Indonesia has estimated that the incidence of cancer here is 50/100,000, and the incidence of cervical carcinoma is the highest among all types.³ At the Dr. Cipto Mangunkusumo Hospital from 1978 to 1982, a total of 3,874

cases of gynecological cancer were treated, 73% of which were cervical carcinoma.¹

In 1985, Mangunkusumo *et al.* at the Department of Anatomic Pathology, Faculty of Medicine, University of Indonesia, Jakarta, reported that among the 10 most frequent primary malignant tumors by location, cervical carcinoma was the most frequent (24.4%), followed by breast cancer (20.1%) and rectal cancer (6.6%).⁴ The American Cancer Society es-

estimated that in 1987, there were 14,000 new cases of invasive cervical carcinoma, 6,800 of which were fatal.⁵

Most patients seek medical treatment when they are already in an advanced stage. Waggoner and Spratt⁶ found that 374 cases (39.58%) out of 945 cervical carcinoma cases were in stage III.

Although sophisticated techniques such as computed tomography and magnetic resonance imaging are available for assessing the spread of cervical carcinoma, it is still adequate and economic to use such conventional clinical procedures as physical and radiological examination (chest x-ray and intravenous urography), cystoscopy, and rectosigmoidoscopy.^{1,2,5-15}

Intravenous urography is a useful procedure in the evaluation of uterine cervix cancer because it can detect ureteral obstruction, which is an excellent indicator of the stage of the disease. Ureteral obstruction suggests an advanced stage of the disease, at least stage IIIb.⁸

Friedland *et al.*¹⁴ found that 15-35% of their cases had unilateral or bilateral hydronephrosis, while Meschan *et al.*¹⁵ found hydronephrosis in 20%. Hydronephrosis leads to renal failure, the main cause of death in cervical carcinoma, resulting from bilateral ureteral obstructions.

This study is to evaluate the importance of intravenous urography in staging cervical carcinoma when urinary tract obstruction is present.

MATERIALS AND METHODS

MATERIALS

Patients were histopathologically proven cervical carcinoma cases referred by the Department of Obstetrics and Gynecology, Dr. Cipto Mangunkusumo Hospital/Faculty of Medicine, University of Indonesia, to undergo intravenous urography at the Department of Radiology of the same hospital, before treatment, from January 2 to December 31, 1991. During this period 174 cases were referred. These cases were grouped by age, stage of disease, and abnormality of intravenous urogram due to cervix carcinoma or other factors. Ten cases had abnormal intravenous urograms due to other factors and were excluded from the study. They comprised of 7 cases of concretion, 2 of chronic pyelonephritis, and 1 mobile kidney.

On the basis of their intravenous urograms, the 164 cases were grouped by stage of disease. Cases with urinary tract obstruction were further grouped by stage

of disease, grade of obstruction/hydronephrosis, site of obstruction, as well as relationship of stage of disease and grade of obstruction. The difference between stage of disease assessed with and without the data obtained from intravenous urography, and the correlation between obstruction and increase in blood urea level were also evaluated.

METHODS

Intravenous urography technique

Patients were prepared in accordance with the standard procedure advised in the literature.

The x-ray apparatus used was a Diagnost-62 (maximum 150 kV and 1000 mA) with a Super M-80 Philips control table. Another model used was a Polytome U (maximum 140 kV and 1000 mA) with a Super M-80 Philips control table and Agfa Gevaert medium speed blue sensitive film screens (30 cm x 40 cm, 24 cm x 30 cm and 18 cm x 24 cm).

A preliminary examination was performed using a plain x-ray of the abdomen to test the apparatus and assess the patient's preparation. If the preparation was adequate, the examination was continued.

For contrast, 20-40 cc 76% Urografin was given intravenously in the *vena cubiti* using a wing needle. The needle was kept in place throughout the whole procedure. After the procedure was finished, compression was applied 2-3 cm below the umbilicus and maintained for 10 minutes.

With the patient in a supine position, x-rays were taken 5 and 10 min after the injection using 24 x 30 cm films to obtain a projection of the kidney region. Compression was released after the second film. A further x-ray was taken 20 min after the injection using 30 x 40 cm film.

With the patient in a prone position 30 min after the injection, a 30 x 40 cm x-ray was taken. With the patient in a supine position with an empty bladder, a final x-ray was taken using 18 x 24 cm film, to obtain a projection of the bladder. X-rays at 60 or 120 min or later after the injection were taken if indicated.

Interpretation

These intravenous urograms were taken by radiologists of the Urinary Tract Group of the Dr. Cipto Mangunkusumo Hospital/Faculty of Medicine of the University of Indonesia. The intravenous urograms were analysed for the presence of unilateral visualization, ureter deviation, and bladder indentation.

Staging

Uterine cervix carcinoma was staged according to the FIGO criteria (1976). When hydronephrosis and/ or non visualization of the kidney were present, cases were grouped in Stage IIIb.

Criteria of urinary tract obstruction and non visualization of the kidney

Urinary tract obstruction

The type of urinary tract obstruction discussed in this paper is that which is due to cervical carcinoma and manifested in the urogram as hydronephrosis.

The grading was done according to the FIGO criteria, described below, for the grading of hydronephrosis, Grade I through IV.¹⁶

Grade I:

Calicectasis, dilatation of the calices, is present, with slight blunting of the caliceal fornices.

Normal calices under compression present the same appearance in the intravenous urogram.

Grade II:

The blunting of the caliceal fornices is more obvious, and the calices are enlarged, but the negative shadows of the renal papillae are still easily recognizable.

Grade III:

Rounding of the calices is present, while the renal papillae are no longer visible. The parenchyma of the kidney has become thinner.

Grade IV:

The calices are ballooning. The parenchyma of the kidney has become even thinner.

Non visualization of the kidney

One hundred and twenty minutes after intravenous contrast injection, neither the parenchyma nor the pelvicaliceal system was visualized.

Analysis

The data presented is descriptive, but the correlation between urinary tract obstruction and the stage of the disease as well as the difference between the staging with and without additional data from intravenous urography was analysed using the chi square statistical test.

The correlation between urinary tract obstruction and increased blood urea was analysed using the Fisher absolute test ($p < .01$).

RESULTS

Age distribution

The age distribution of the 174 cases with cervical carcinoma that underwent intravenous urography before treatment (total age range 26-80) showed the highest concentrations at the 40-49 (50 cases, 29%) and 50-59 age groups (49 cases, 28.1%). (Figure 1).

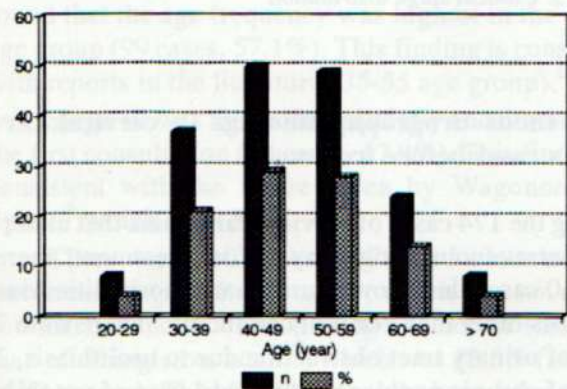


Figure 1. Age distribution

Clinical stage of the disease assessed before intravenous urography

All the cases sent for intravenous urography had their clinical stages assessed. Most were assessed as stage III (83 cases, 47.8%) (Table 1 and Figure 2).

Table 1. The clinical stages of the patients with carcinoma of the uterine cervix before intravenous urography

Stage	Number of cases	
I A	1	17,2
I B	29	
II A	10	
B	44	31,0
III A	2	
B	81	47,8
IV A	7	
B	0	4,0
Total	174	100,0

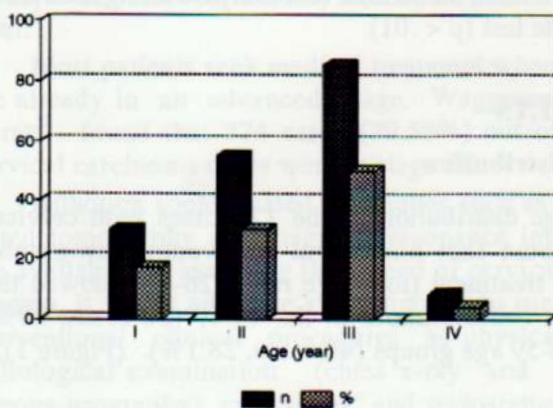


Figure 2. Clinical stage distribution

Intravenous urography findings in cervical carcinoma cases before treatment

Among the 174 cases of cervical carcinoma that underwent intravenous urography before treatment, there were 10 cases that showed urogram abnormalities due to factors other than cervical carcinoma. There were 7 cases of urinary tract obstruction due to urolithiasis, 2 cases of chronic pyelonephritis, and 1 case of a mobile kidney.

The remaining 164 cases which were evaluated showed the urogram abnormalities presented in Table 2. There were 33 cases (20.1%) of urinary tract obstruction due to cervical carcinoma.

Table 2. Intravenous urogram findings in patients with carcinoma of the uterine cervix in each stage assessed without the data from intravenous urography

Findings	Stage I-II	Stage III-IV
Normal	68	35
Unilateral- Bilateral- hydronephrosis	4 0	20 5
Unilateral- Bilateral- non visualization	3 0	14 0
Hydronephrosis Non visualization	2	2
Ureteral deviation	2	0
Bladder indentation	5	4
Total	84	80

Correlation between urinary tract obstruction and clinical stage of the disease

The urogram findings showed urinary tract obstruction in each stage of the disease (I-II and III-IV). The correlation between urinary tract obstruction and the severity of the disease was evaluated (Table 3).

It was concluded that there was a significant correlation between urinary tract obstruction and the severity of the disease ($p < .01$).

Table 3. Correlation between urinary tract obstruction and clinical stage of the disease

Stage	Presence of obstruction	Absence of obstruction	Total
I-II	6	78	84
III-IV	27	53	80
Total	33	131	164

Urinary tract obstruction grade

Among the 33 cases with urinary tract obstruction, there were 6 (18.2%) at grades I-II and 27 (81.8%) at grades III-IV (Figure 3).

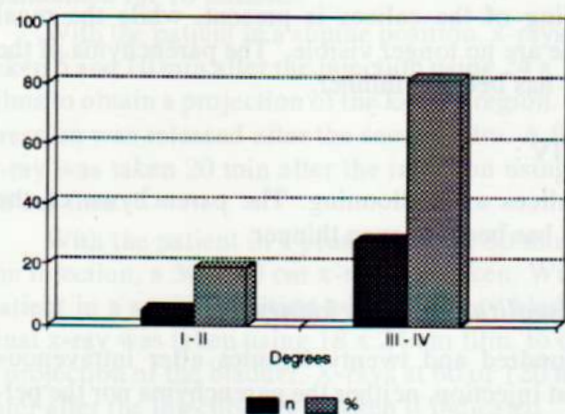


Figure 3. The degree of obstruction

Urinary tract obstruction site

Of these 33 cases, 31 (94%) had obstructions at the distal third of the ureter and 2 (6%) at the medial third (Figure 4).

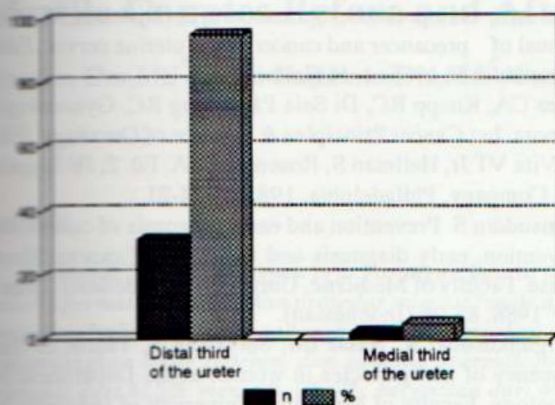


Figure 4. The site of urinary tract obstruction

Differences between staging with and without additional data from intravenous urography

When such abnormalities in intravenous urograms as urinary tract obstruction and non visualization of the kidney which supported upstaging cases previously classed at stages I and II to the higher stage of IIIB were found, then the difference between staging with and without the additional data derived from the intravenous urogram was evaluated to see whether there was a significant difference (Table 4).

The difference being $p < .01$, it was concluded that there was no significant difference between the stage of the disease assessed without and using additional data from intravenous urography.

Table 4. The difference between the clinical stage assessed with and without additional data from intravenous urography

	Stage I-II	Stage III-IV	Total
With additional data from IU	84	80	164
Without additional data from IU	75	89	164

IU = Intravenous urography

Blood urea level distribution in patients with ureter obstruction

The blood urea level in patients with ureteral obstruction in this study was as stated in Table 5.

A test of significance using the Fisher absolute test gave the value of $p < .01$.

Table 5. Blood urea in patients with obstruction

Obstruction	20-30 mg/dl	30-40 mg/dl
Unilateral	26 (93 %)	2 (7 %)
Bilateral	1 (20 %)	4 (80 %)

DISCUSSION

Among the 174 cases of cervical carcinoma that underwent intravenous urography before treatment, we found that the age frequency was highest in the 40-59 age group (99 cases, 57.1%). This finding is consistent with reports in the literature (35-55 age group).^{1,14}

Stage III was the most frequently encountered on the first consultation (83 cases, 47.8%). This finding is consistent with the figure given by Wagonner and Spratt,⁶ which is 39.58%.

There were 10 cases (5.7%) of abnormal intravenous urogram in this study, which was not due to cervical carcinoma. This finding was not in line with that of Shingleton *et al.*¹⁰, which was 13.0% (109 out of 834 cases). This difference might have been due to the smaller number of cases involved in this study or to differences in patterns of urinary tract diseases not due to cervical carcinoma.

In this study, the incidence of urinary tract obstruction was 33 out of 164 cases (20.1%). This is very much in line with other findings cited in the literature, which are 15-35%¹⁴ and 20%.¹⁵

The correlation between urinary tract obstruction and the clinical stage of the disease was statistically significant ($P < .01$). The more advanced the stage, the more obvious the obstruction (Tables 2 and 3). This condition is definitely in line with what we know about carcinoma of the cervix, which is usually characterized by lymphogenic spreading, metastasis to the peri-ureteral lymph nodes causing ureteral obstruction. In addition, the growth of the tumor itself at the junction of the vaginal fornices and the vaginal anterior wall and proximal to the openings of the ureters into the bladder, can cause ureteral compression.

In this study, there was a high incidence of urinary tract obstruction at Stages III and IV (81.8%). At these stages, the condition is irreversible, even when the obstruction is eliminated, while it is reversible at Stages I and II, and, if the obstruction is eliminated, kidney damage can be prevented.

Determination of the existence of obvious urinary tract obstruction and a higher stage of the disease can help in arriving at an approximate evaluation of the condition of the kidneys, which in turn can both assist in improving case management and help determine the prognosis, one of the main causes of death being renal failure due to bilateral ureteral obstruction.¹⁴

It is believed that intravenous urography before treatment can provide important preliminary data, because ureteral obstruction could well be due to enlargement of the tumor or complications due to therapy.¹⁰

In this study, patients with obstruction had the urea level variations shown in Table 5. Among the 33 cases of obstruction, 28 were unilateral. As many as 93% of these unilateral obstruction cases had blood urea levels of 20-30 mg/dl, while 7% had levels of 30-40 mg/dl.

There were 5 cases of bilateral obstruction, 80% of which had blood urea levels of 30-40 mg/dl. The blood urea levels of patients with bilateral obstruction, although still in the normal range, showed a significant difference from those of patients with unilateral obstruction ($p < .01$).

These findings are similar to those of Shingleton, *et al.*⁹ in a research project concerning the evaluation of cervical carcinoma before treatment. They found that only bilateral obstructions gave rise to a significant increase in blood urea levels. However, blood urea levels are not an accurate indicator for assessing the progressivity of a tumor, because abnormality occurs only when bilateral obstruction is present.

In this study, we found that 31 out of 33 (94%) cases had obstruction located at the distal third of the ureter. This finding is close to that of Friedland *et al.*,¹⁴ which was 90%.

Assessments made with the support of additional data obtained from intravenous urography were slightly higher, and, although there was no statistically significant difference ($P > .01$) in the assessments of the clinical stage made without intravenous urography, there was a slight, but clinically valuable tendency toward upstaged assessments when these additional data were available, and thus to some extent understaging, with its unfortunate clinical implications, was avoided. Therefore, we conclude that intravenous urography is a useful additional diagnostic tool in determining the clinical stage of cervical carcinoma.

Hillman *et al.*,⁹ found that the sensitivity of intravenous urography for assessing tumor extent was 7-33%, while its specificity was 79-97%.

It would appear, therefore, that because of this high level of specificity, in spite of its low sensitivity, the use of intravenous urography in staging cervical carcinoma should not be abandoned.

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