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URINARY TRACT INFECTION AFTER VAGINAL SURGERY

Effect of prophylactic treatment with methenamine hippurate

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Abstract. One hundred and nine consecutive patients undergoing surgery for uterovaginal prolapse followed by indwelling urinary catheter for 3 days were randomized for prophylactic treatment with methenamine hippurate (MH) or no MH prophylaxis. Significantly less bacteriuria occurred in the MH-treated patient group. In particular, the opportunistic hospital flora appeared to be suppressed by MH treatment. It is suggested that MH prophylaxis, 1 g three times daily, be used in gynecological surgery followed by short-term urinary catheterization.

Key words: Gynaecological surgery, indwelling catheter, bacteriuria, methenamine hippurate

After gynecological surgery, women often receive a urinary catheter in order to ensure bladder drainage. Catheter treatment rapidly results in bacteriuria (1). Previously, chemotherapeutic agents were used against catheter-induced bacteriuria, but these had only a transient effect on catheter-induced bacteriuria (1, 2, 3). In addition, the patient's endogenous bacterical flora was profoundly disturbed, with selection of multiresistant opportunistic strains of bacteria (1, 2, 3).

In contrast to chemotherapeutics, methenamine hippurate (MH) has no negative effect on the endogenous bacterial flora of the patients (4). Moreover, side effects of MH are rare (1, 2, 3, 4, 5, 6, 7). The objective of the present study was to elucidate the efficacy of MH in preventing the development of bacteriuria in women operated on for uterovaginal prolapse and nursed with an indwelling catheter for 3 days in the postoperative period.

MATERIAL AND METHODS

Design

The trial was designed as an open controlled study, prospective and randomized, with bacterial culture as an objective parameter.

Patients

One hundred and nine consecutive patients undergoing surgery for uterovaginal prolapse were recruited. The day prior to surgery, they were allocated at random to methenamine hippurate prophylaxis, or to the control group without MH prophylaxis.

Catheter regimen

A latex catheter, two-way Foley balloon No. 16 or 18 Charrière (Astra-Meditec, Mölndal, Sweden), was inserted into the bladder following surgery. The urine was allowed to flow continuously into the bag. The catheter was removed 3 days later. If the residual urine exceeded 20 ml when the catheter was withdrawn, the bladder was drained by intermittent catheterization until less than 20 ml urine was obtained. There was no difference between the patient groups as regards number of catheterizations.

Quantitative bacterial cultures

A clean voided midstream urine specimen was obtained for bacterial culture *i*) on the day prior to surgery, *ii*) 7 days post-surgery.

In the following text, bacteriuria denotes more than 10^5 organisms per ml urine. Organisms other than *E. coli* were considered to constitute opportunistic hospital flora.

Methenamine hippurate

Methenamine hippurate (Hiprex^R, 3M Riker Laboratories, Loughborough, Leicestershire, England), 1 g oral tablets, was used as follows: *i*) 1 g the night before surgery, *ii*) 1 g twice on the day of surgery, *iii*) 1 g three times daily on the 5 days following surgery.

Chemotherapy

Patients with a positive pre-surgery culture were excluded from the analysis. Chemotheraopy was only prescribed when a patient developed symptomatic bacteriuria.

Statistics

Fisher's exact probability test and the sign test were calculated according to Siegel 1956 (8).

RESULTS

The patients are described in Table I as regards age, pre-surgery residual urine volume and history of uri-

Table I. *Patients treated with methenamine hippurate (MH) or serving as controls.*

	MH-treated patients n (±2SD)	Control patients n (±2SD)
Age	65 (63 – 67)	63 (61 – 65)
Pre-surgery residual urine volume	47 (28 – 66)	50 (26 – 73)
No. of patients with a history of UTI	12	16
No. of patients recruited	51	58
No. of patients excluded	6	9

nary tract infection. Fifteen patients had bacteriuria prior to surgery and were therefore excluded from the analysis. Treatment group and control group were still comparable regarding age, residual urine volume, and history of urinary tract infections. No side effects of treatment with methenamine hippurate were reported by the patients.

The results of prophylactic treatment with MH are shown in Table II. Methenamine hippurate significantly reduced the incidence of bacteriuria. The reduction ranged from 2 to 13 times lower incidence of bacteriuria in the MH-treated patients, depending on the categorization of the bacteriuria (Table II). A closer analysis of the bacteriurias suggested that MH prophylaxis was especially effective in suppressing the opportunistic hospital flora associated with frequent use of urinary catheters and antibiotics (Table III).

DISCUSSION

The present study showed that prophylactic treatment with methenamine hippurate significantly reduced the incidence of bacteriuria in women one week after surgery for prolapse, with subsequent indwelling catheter for 3 days. The effect of MH was of such an order of magnitude as to warrant its use for routine prophylaxis, following such surgery (Table II).

The results of the present study concur with those of two previous studies of methenamine prophylaxis in patients after gynecological surgery (9, 10). Methenamine hippurate is also reported to be of value as a prophylactic agent in cystoscopy (11), in prostatic surgery (12, 13), in recurrent urinary tract infections (5, 6, 14), and in long-term treatment with indwelling catheters (1, 2, 3, 7).

Table II. *Effect of methenamine hippurate (MH) prophylaxis after vaginal surgery; urine culture performed at the one-week post-surgery check-up.*

	MH-treated group	Control group	Significance (Fisher test)
Asymptomatic bacteriuria	4/45	8/49	$p > 0.05$
Symptomatic bacteriuria	1/45	14/49	$p < 0.001$
Total	5/45	22/49	$p < 0.001$

The mode of action of MH is interesting. Methenamine hippurate is the hippuric acid salt of methenamine and is absorbed mainly as the salt in the intestine. It is excreted in the urine and cleaved to hippuric acid and methenamine. Hippuric acid exerts a weak bacteriostatic effect due to acidification of the urine. Methenamine is hydrolysed and releases formaldehyde in acid urine. The main bacteriostatic effect of MH is thought to be mediated by formaldehyde (15, 16, 17, 18), and due to a non-specific physical action. No selection of resistant strains has been reported (4). On the contrary, the break-through urinary tract infections in the MH-treated patients in the present study were caused mainly by *E. coli* (Table III). The nosocomial break-throughs occurred mainly in the control group, 12/13 (Table III). This difference between the groups, evaluated by the sign test, was significant ($p = 0.002$).

It is reasonable to conclude that MH prophylaxis in prolapse-operated women with short-term postoperative urinary catheterization is of bacteriological and ecological advantage.

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Table III. *The bacterial strains isolated at the one-week postsurgery check.*

	MH-treated group	Control group
E. coli	4	11
Enterococcus	–	4
Proteus spp	–	4
Klebsiella	–	3
Staph.epid.	–	1
Pseucomonas	1	–

MH: methenamine hippurate

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