Perioperative prophylaxis in abdominal and vaginal hysterectomy

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Summary: The aim of this study is to evaluate the clinical efficiency of perioperative short-term prophylaxis in gynecological surgery, in order to prevent both systemic and local infections, caused either by aerobic or by anaerobic bacteria.

A group of 320 patients, undergoing abdominal or vaginal hysterectomy and treated with perioperative antibiotic prophylaxis is compared, with 320 women undergoing conventional wide-spectrum antibiotic treatment from the first post-operative day for 4-5 days.

Key words: Hysterectomy; Antibiotic prophylaxis.

INTRODUCTION

The basis for an adequate antibiotic prophylaxis in obstetric-gynecologic surgery must consider the risks, costs and benefits of perioperative antibiotic treatment ([7, 8, 17, 18]). In fact it is advisable to choose a wide-spectrum drug ([3, 9]), having such characteristics as to guarantee penetration into the tissues concerned and a higher concentration than the MIC for the whole time required for the operation ([5]).

Ceftriaxone is a methoxy-amine cephalosporin active against the most common $Gram^+$ and $Gram^-$ bacteria: among the beta-lactam antibiotics it has a particularly prolonged activity, which allows it to maintain a plasmatic and tissue concentration above the MIC of most sensible germs, for over 24 hours.

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Piperacillin is a semisynthetic penicillin, with a wide spectrum of bactericidal activity. The wide activity spectrum is extended both to $Gram^+$ and to $Gram^-$ bacteria, including anaerobic ones.

Since the most common micro-organism involved in infective post-operative complications are the Staphylococcus aureus, Streptococcus sp., Enterococcus, E. Coli, Enterobacter, Proteus, Serratia, Acinetobacter, Klebsiella and, rarely, Pseudomonas aeruginosa and, among anaerobic bacteria, the Peptococcus, Bacteroides fragilis, Bacteroides spp., these two antibiotics represent a reasonable approach to perioperative prophylaxis in gynecological surgery.

Antimicrobic prophylaxis has significantly reduced the incidence of infectious complications ([4, 13, 14]).

The aim of our study is therefore to evaluate the clinical efficiency of the short-term prophylaxis in gynecological surgery, in order to prevent infections of the operative site caused either by aerobic or by

anaerobic bacteria, coming from the lower reproductive tract flora.

Moreover we believe that the antibiotic prophylaxis can also prevent systemic infections, which could be responsible for a considerable extension of hospital stay and compromise the outcome of surgery.

MATERIALS AND METHODS

We evaluated the cases of 216 women undergoing abdominal hysterectomy and 104 patients undergoing vaginal hysterectomy during 1990-1991 and treated with perioperative prophylaxis in our Department of Obstetrics and Gynecology of S. Andrea Hospital, Vercelli, Midwifery School (University of Turin).

Group A, treated with antibiotic prophylaxis, was compared with Group B, including 236 abdominal hysterectomies and 84 vaginal hysterectomies performed in 1985-1986 and undergoing conventional wide-spectrum antibiotic treatment from the first post-operative day for 4-5 days. We considered several parameters (age, height, weight, socioeconomic status, reason for operation, associated diseases, duration of surgery, days of catheterization, days of hospitalization, postoperative febrile morbidity and presence of risk factors for infections) to check the statistically significant efficacy of postoperative prophylaxis.

The exclusion criteria were ([12]):

- history of hypersensitivity to beta-lactam antibiotics;
- urinary tract symptomatic infection and/or preoperative urine culture with 100.000 CFU/ml of a urinary pathogen;
- preoperative infection and/or temperature $\geq 38°$ C within 48 hours before surgery;
- antimicrobial treatment within the last 7 days before surgery.

We also considered the presence of risk factors ([16]) for infections, such as obesity, age over 70 years, preoperative chemotherapy, preoperative radiotherapy, operation for cancer, Hb <8 g%, diabetes mellitus, hysterectomy with repair for urinary stress incontnence (USI), heart failure, renal insufficiency, pulmonary insufficiency, hepatic disease.

Each eligible patient in group A received randomly short-term prophylaxis with Ceftriaxone (2 gr I.M. 30 min. before operation) or with Piperacillina (1 gr I.M. 30 min. before operation and 16 hours after operation).

The antibiotics used in Group B for the conventional wide-spectrum antibiotic treatment from the first postoperative day for four/five days were Piperacillin (1 gr $\times$ 3/die I.M.), Cefataxime (1 gr $\times$ 2/die I.M.), Ceftizoxime (1 gr $\times$2/die I.M.), Ampicillin (1 gr $\times$3/die I.M.) and Aztreonam (0.5 gr $\times$2/die I.M.).

Routine preoperative laboratory studies (performed once preoperatively and once on days 4.6 or 8 after surgery) included a complete blood count with differential leukocyte and platelet counts, blood chemistry profile (SMA), serum glutamic oxalacetic and glutamic pyruvic transaminases and complete urine analysis. A urine specimen was also collected before the bladder catheter withdrawal and before hospital discharge for culture and sensitivity testing.

A bacteriological vaginal culture was performed postoperatively on the last day of hospital stay.

We used the following criteria for post-operative morbidity evaluation:

- wound infection with purulent exudate (either spontaneously or when opened) with or without potential pathogen isolated from the discharge;
- pelvic abscess and cellulitis with induration, edema and tenderness on bimanual pelvic examination or hematoma with fever;
- vaginal cuff infection with fever, pelvic pain, purulent material in vaginal cuff area;
- non-infectious unexplained febrile morbidity, defined as two consecutive temperature elevations greater than 38° C (taken at intervals of 6 hours) of unexplained origin and with clinical signs and symptoms, more than 48 hours after surgery;
- urinary tract infection with growth of >100.000 CFU/ml of single pathogen;
- respiratory tract infection in patients with pulmonary symptoms and signs indicating fever.

The analysis of basal temperature was carried out for ten days after the operation. The reduction of basal temperature in the post-operative stay of the cases treated with prophylaxis was evaluated by fluctuation of temperature during 0 to 10 postoperative days, considering the temperature of 37° C as a threshold value.

Statistical analysis was carried out with Student test and Chisquare test (Fisher's exact test) to compare days of catheterization, days of hospitalization, postoperative febrile morbidity and efficacy in the postoperative febrile morbidity as between the two groups.

We finally compared the two antibiotics used for perioperative prophylaxis, with regard to postoperative febrile morbidity.

RESULTS

Table 1 summarizes demographic data, reasons for surgery and surgical characteristics for the subjects included in groups

Table 1.

	Abdominal H		Vaginal H	
	Group A (n=216)	Group B (n=236)	Group A (n=104)	Group B (n=84)
AGE	51.43±8.27	51.17±8.83	61.54±7.43	59.9±10.49
Height (cm)	161.13±5.85	160.98±6.0	163.15±6.46	158.8± 7.19
Weight (kg)	60.96±8.04	66.56±10.52	62.38±7.79	56.55±14.76
Socioeconomic status				
high	7.4%	10.1%	–	9.5%
medium	74 %	72.8%	88.4%	61.9%
low	18.6%	17.1%	11.5%	28.5%
Reason for surgery:				
leiomyomas	42.5%	50.8%	–	–
abnormal bleeding	31.5%	23.7%	–	–
pelvic relaxation	3.7%	–	100%	100%
cancer	16.6%	16.9%	–	–
cervical dysplasia	1.8%	1.7%	–	–
other	3.7%	6.7%	–	–
Surgery length (min.)	68±22	69±21	69±25	70±26
Days catheterized	2.83±0.82	2.55±0.92 (P=0.18) (NS)	8.13±0.52	8.25±0.87 (P=0.66) (NS)
Day hospitalized	10.74±1.36	15.55±5.83 (P=<0.001) (S)	11.2 ±0.27	15.58±3.9 (P=<0.001) (S)

A and B and underging abdominal and vaginal hysterectomy. We found a significant difference ($P<0.001$) between groups A and B in Hospital stay.

No significant differences were detected among other parameters analyzed. The analysis of associated disease in abdominal hysterectomy revealed in group A an incidence of 7.4% for ovarian cyst, 1.8% for endometrioma 3.7% for micropolycystic ovary, 1.3% for hepatic cyst, 1.8% for cervical metritis and 3.7% for cervical polyp.

In group B we had an incidence of 13.5% for ovarian cyst, 1.7% for endometrioma, 15.2% micropolycystic ovary, 1.7% pelvic endometriosis, 1.7% for hyperplastic salpingitis, 1.7% for hydrometra, 3.4% for pelvic varicosis, 5.1% for cervical metritis and 3.4% for cervical polyp.

Table 2 shows the presence of risk factors in the two groups undergoing abdominal and vaginal hysterectomy.

Table 3 shows postoperative febrile morbidity in the two groups where there were significant differences between group A and B in vaginal hysterectomy ($p<0.001$), in the incidence of vaginal cuff abscess, urinary tract infection, and respiratory tract infection (infectious morbidity).

Table 2.

Variable	Abdominal H		Vaginal H	
	Group A (n=216)	Group B (n=236)	Group A (n=104)	Group B (n=84)
Obesity	3.7%	5.1%	3.8%	–
Age over 70 years	1.8%	3.4%	7.7%	19 %
Preoperative chemotherapy	–	–	–	–
Perioperative radiotherapy	–	–	–	–
Operation for cancer	16.6%	15.2%	–	–
HB $\leqslant$ 9 g%	9.2%	–	–	4.7%
Diabetes Mellitus	7.4%	13.5%	11.5%	19 %
Hysterectomy with repair for U.S.I.	3.7%	1.7%	50 %	42.8%
Heart failure	1.8%	6.7%	7.7%	9.5%
Renal insufficiency	–	–	–	–
Pulmonary insufficiency	–	–	–	–
Hepatic disease	–	1.7%	–	9.5%

Table 4 compares the two antibiotics used in perioperative febrile morbidity: no significant differences were detected.

In abdominal hysterectomy, pathogens identified in patients of Group A with infectious morbidity were E. coli (3.7%) in urinary tract infections and Staphylococcus a. (0.9%), Streptococcus sp. (0.9%) in wound infections.

In Group B we found an incidence of 0.8% for Proteus and of 0.8% for Enterococcus in urinary tract infections and an incidence of 1.6% for Staphylococcus a. in wound infections.

In vaginal hysterectomy pathogens in patients with infectious morbidity occurred only in group B, and were E. coli (9.4%) in vaginal cuff abscess and E. coli

Table 3.

Diagnosis	Abdominal H			Vaginal H		
	Group A (n=216)	Group B (n=236)	Chi-2	Group A (n=104)	Group B (n=84)	Chi-2
Wound infection	1.8%	5.1%	0.008 (NS)	–	–	–
Pelvic cellulitis	–	–	–	–	–	–
Vaginal cuff abscess	–	–	–	–	9.5%	$p<0.001$
Urinary tract infection	3.7%	2.5%	0.19 (NS)	–	9.5%	$p<0.001$
Respiratory tract infection	6.5%	10.2%	1.57 (NS)	3.8%	23.8%	$p<0.001$
Unexplained non-infectious febrile morbidity	9.2%	5.1%	3.47 (NS)	7.7%	9.5%	0.03

Table 4.

Diagnosis	Abdominal H			Vaginal H		
	Ceftriaxone (n=116)	Piperacillina (n=100)	Chi-2	Ceftriaxone (n=52)	Piperacillina (n=52)	Chi-2
Wound infection	1.7%	2%	1.58 (NS)	–	–	–
Urinary tract infection	1.7%	–	0.5 (NS)	–	–	–
Respiratory tract infection	6.9%	6%	0.0 (NS)	7.7%	–	0.1 (NS)
Unexplained non infectious febrile morbidity	10.3%	8%	0.12 (NS)	15.4%	–	0.005 (S)

(4.7%), Other Enterobacteria (4.7%) in urinary tract infections.

Fridman's test showed a significant reduction of basal temperature going on with therapy: the multiple comparisons showed a significant difference in basal temperature between the first day and days 4-10.

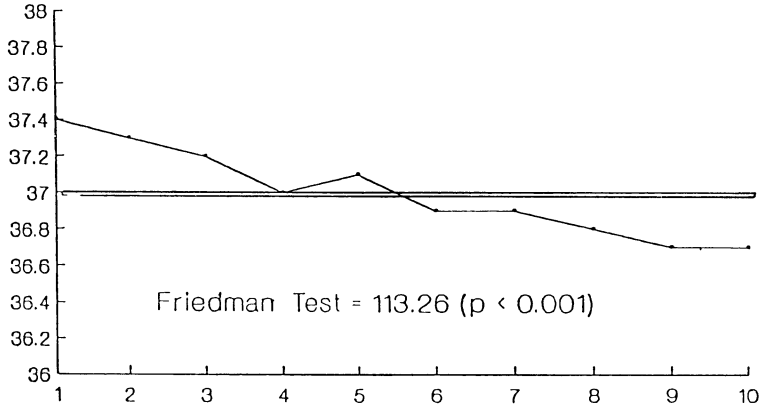
The fluctuations of body temperature showed a significant continuous reduction from a medium basal value of 37.4° C after operation, to 36.7° C on the tenth day in the treated group (Table 5).

COMMENT

Perioperative prophylaxis at the time of abdominal and vaginal hysterectomy is helpful in reducing febrile morbidity and the incidence of serious pelvic infections ([6, 15, 91]).

In our study we saw a significant reduction ($P<0.001$) of postoperative infectious morbidity (vaginal cuff abscess, urinary tract infection, respiratory tract infection) in vaginal hysterectomy in Group A.

Table. 5. — *Fluctuation of basal temperature.*



Day after operation.

Cefamandole and Cefotaxime, when used for phophylaxis, had an incidence of suspected postoperative infections of approximately 20% ([19]).

When antibiotics were not used, up to 60% of patients had infectious complications ([2, 10, 11, 19]).

When polymicrobial pelvic infection occurred, the hospital stay and subsequent costs were boubled ([20]).

The significant difference in hospital stay ($P<0.001$) we found in our study between perioperative prophylaxis and postoperative conventional wide-spectrum antibiotic treatment, with cephalosporins and penicillins, supports the idea that perioperative prophylaxis is less expensive and is more efficacious in preventing infectious morbidity after operation, thus reducing hospital costs.

The results of this study indicate that a single dose of cefotaxim or three doses of piperacillin administered to patients undergoing abdominal and vaginal hysterectomy have equal ability to reduce postoperative infections. However piperacillin is as effective and less expensive than third-generation cephalosporins.

We agree with the American College of the Obstetricians and Gynecologists Committee's Opinion on Gynecologic Pratice: "Although the prophylactic use of antibiotics with abdominal and vaginal hysterectomy decreases overall morbidity, this usage may not be necessary for certain groups of patients with low risks for wound and pelvic infection. A variety of low-cost antimicrobial agents appear to be as effective as higher-cost products" ([1]).

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