cidence calculated from nationwide reports of such infection in all age groups in Canada, 2.87/100 000. This suggests that reporting of acute viral CNS infection is incomplete.[2] The incidence in our study appeared to be highest among young infants, at 94/100 000. A prospective study employing strict diagnostic criteria and uniform laboratory investigations is indicated to establish the incidence of this disease in the various age groups.

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Pyometra

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Pyometra is a potentially lethal disease. Eighteen cases, all but one in postmenopausal women, were diagnosed at the Ottawa General and Ottawa Civic hospitals between 1974 and 1978 inclusive. A review of this series and of the literature demonstrates that a large proportion of cases (72% in this series) are associated with or follow radiotherapy for a malignant disease of the uterus and that anaerobic bacteria are frequently isolated from the uterine cavity (in 56% of the patients in this series). Because pyometra is potentially lethal (one patient in our series died) it should be considered as an abscess and treated promptly and vigorously by evacuation and continued drainage of the uterine cavity. Curettage of the cavity and the endocervical canal after dilatation is essential to rule out asociated malignant disease as well as to debride the necrotic tissue. Antibiotics effective against aerobic and anaerobic bacteria should be given to all patients with signs of systemic infection. Once the infection is controlled, the underlying problem can be treated.

La pyométrie est une maladie qui peut être létale. Entre 1974 et 1978 inclusivement 18 cas ont été diagnostiqués à l'hôpital Général d'Ottawa et à l'hôpital Civic d'Ottawa; dans tous les cas sauf un il s'agissait de femmes en postménopause. L'étude de cette série et une revue de la littérature démontrent qu'une grande partie des cas (72% dans cette série) est associée ou consécutive à une radiothérapie pour un cancer de l'utérus et que des bactéries anaérobiques sont souvent isolées de la cavité utérine (chez 56% des patientes de cette série). Parce que la pyométrie peut être létale (une des patientes de cette série est décédée), elle devrait être considérée comme un abcès et traitée promptement et vigoureusement par évacuation et drainage continu de la cavité utérine. Le curetage après dilatation de la cavité et du canal endocervical est essentiel pour exclure la présence d'un cancer, de même que pour débrider les tissus nécrotiques. Des antibiotiques efficaces contre les bactéries aérobies et anaérobies doivent être administrés chez toute patiente présentant des signes d'infection générale. Une fois l'infection jugulée, le problème sous-jacent peut être traité.

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Pyometra is the accumulation of pus in the uterine cavity resulting from interference with its natural drainage. The most common cause is a malignant lesion of the uterus.[1-3] In postmenopausal women the reported incidence is 0.2%, but among those with malignant lesions of the uterus pyometra is more common, the reported incidence being 1.5% to 4.0%.[2,3] In the premenopausal female pyometra is rare; usually the cause is traumatic damage to the cervix[4] or a congenital anomaly of the genital tract.[5]

In the past, no bacteria could be cultured in 15%

to 35% of cases of pyometra and it was assumed that the fluid in the uterine cavity was sterile in these patients.[4] Other studies using anaerobic cultures have confirmed these findings.[3,6]

The classic symptoms of pyometra — postmenopausal bleeding, vaginal discharge, and uterine enlargement or cramps — will prompt the physician to perform a diagnostic dilatation and curettage. In most cases in the past (73 of 118[7] and 7 of 12,[3] for example) the diagnosis of pyometra was made only at the time of operation,[4] but the introduction of diagnostic ultrasonography to the field of gynecology will aid in preoperative diagnosis.[5]

In this paper we present an illustrative case and the results of a retrospective study of the 18 cases diagnosed at the Ottawa General and Ottawa Civic hospitals in the 5-year period 1974 through 1978.

Case report

A 53-year-old woman was referred to hospital because of postmenopausal bleeding. She was found to have carcinoma of the cervix, stage Ib (invasive but not extending beyond the cervix) and received radiation therapy consisting of two intracavity insertions of cesium, followed by external irradiation with cobalt 60 over a 3½-week period. The total amounts of radiation given to the patient at four points were: AR, 8110 rad; AL, 7765 rad; BR, 5655 rad; and BL, 5490 rad (A = 2 cm and B = 5 cm lateral to the internal cervical os; R = right; L = left). The patient tolerated the therapy well.

Six months later no lesion was visible or palpable, and cytologic examination showed no evidence of malignant disease. However, 1 week afterwards the patient began to complain of diffuse lower abdominal pain associated with nausea and vomiting. When admitted to another hospital she had a temperature of 40.5°C and was dehydrated and in distress. A tender pelvic mass was noted, and pus was seen escaping from the cervical os. Antibiotic therapy (with ampicillin, 1.0 g every 4 hours, and gentamicin, 60 mg every 8 hours) was started. Laboratory data are not available.

Soon afterwards on the day of admission signs of profound shock developed. Laparotomy and bilateral salpingo-oophorectomy were performed that day, but the uterus was left intact and was not drained. Postoperatively her condition deteriorated further and dopamine was required to maintain an adequate blood pressure. Clindamycin (500 mg every 4 hours) was added along with methylprednisolone sodium succinate and isoproterenol hydrochloride to her drug regimen.

Her condition continued to deteriorate, and on the second day after the operation a dilatation and curettage was performed; 15 ml of green, purulent material drained from the uterus. The patient was then transferred to our hospital but died in the emergency room. The autopsy findings were typical of septic shock. The uterus was inflamed, with boggy induration of its wall; the cavity contained pus, and the endometrium was necrotic (Fig. 1). The upper cervical canal was obstructed by a plaque of fibrous tissue at the site of the treated carcinoma (Fig. 2A). Histologic examination of tissue from this site did not reveal residual carcinoma, and the cervix was free of malignant disease (Fig. 2B).

Retrospective study

In a review of charts for the years 1974 to 1978 inclusive at the Ottawa General and Ottawa Civic hospitals we found 18 cases of pyometra among the 15 860 gynecologic patients. The diagnosis was established clinically from the observation of large amounts of pus (10 ml or more) escaping from the uterus after dilatation of the cervix. All cases were confirmed by histologic examination of the endometrial curettings.

Results

Patients' ages: All but one of the patients were postmenopausal. Their ages ranged from 30 to 84 years, with an average of 65. In the postmenopausal patients the menopause had occurred 7 to 36 years (mean 9 years) before the pyometra.

Presenting problems: Postmenopausal bleeding was the presenting problem in 11 of the 18 patients, and in four instances vaginal discharge was also present. Three patients initially complained of vaginitis and three presented with a fever. A pelvic mass was the first sign of pyometra in one patient.

Associated abnormalities: In 10 of the patients no evidence of other active disease was noted. Five of

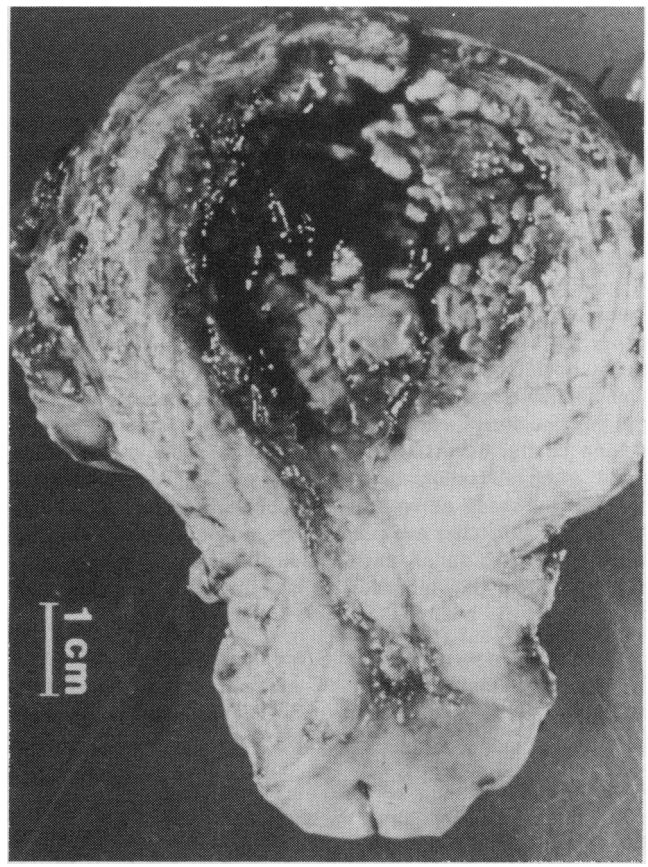

FIG. 1—Coronal section of uterus at autopsy, showing polypoid configuration of inflamed and necrotic endometrium.

them had been treated for carcinoma of the cervix by radiotherapy 6 months to 16 years before the occurrence of pyometra, but all were free of malignant disease at the time pyometra developed. This late complication proved to be fatal in one of the five. Pyometra was diagnosed in another patient (the only premenopausal patient in the series) 12 days after the repair of a cervical laceration caused by delivery of an infant.

In seven of the remaining eight patients carcinoma of the cervix was responsible for the blockage of the cervical canal. A polypoid mixed mesodermal tumour of the uterus was obstructing the cervical canal in the eighth patient.

Bacteriologic findings (Tables I and II): Ten different organisms were cultured from specimens from 15 of the patients. In the other three cases (17%) all cultures were sterile. A single organism was isolated in four cases. In seven patients there were mixed infections with two organisms, and in two cases each three or four organisms were isolated. The most common organism was *Bacteroides fragilis*. In five cases (33%) only anaerobic bacteria were isolated.

Table I—Bacteria associated with pyometra in 15 patients

Bacterium	No. of patients*
Bacteroides fragilis	9
Anaerobic streptococcus	7
Escherichia coli	5
Enterococcus	3
Streptococcus viridans	2
Klebsiella pneumoniae	2
Peptococcus	1
Peptostreptococcus	1
Pseudomonas aeruginosa	1
Staphylococcus aureus	1

*More than one organism was isolated from 11 patients.

Management (Table II): Dilatation and curettage was the primary treatment in 15 cases; further drainage was secured in 3 cases by a rubber tube. Hysterectomy was performed in two cases, and one other patient

Table II—Bacteriologic, antibiotic and surgical data for 18 cases of pyometra

Patient no.	Organism(s) cultured	Antibiotic(s) administered	Surgical treatment*
1	*P. aeruginosa*		TAH, BSO
2	Enterococcus	Ampicillin	D & C
3	None	Ampicillin	D & C
4	*B. fragilis*, anaerobic streptococcus	Ampicillin, gentamicin	D & C
5	*E. coli*, enterococcus	Ampicillin	D & C, drainage
6	None	Ampicillin	D & C
7	*B. fragilis*, *S. viridans*	Gentamicin, clindamycin	D & C
8	*B. fragilis*, peptostreptococcus, anaerobic streptococcus	Gentamicin, clindamycin	D & C, drainage
9	*S. aureus*, *S. viridans*	Ampicillin, gentamicin	D & C, drainage
10	None	Ampicillin	D & C
11	*B. fragilis*, anaerobic streptococcus	Ampicillin, gentamicin	D & C
12	*B. fragilis*, *E. coli*, enterococcus, peptococcus	Ampicillin, clindamycin	D & C
13	*E. coli*, *B. fragilis*	Ampicillin, gentamicin	D & C
14	Anaerobic streptococcus	Ampicillin, gentamicin, clindamycin	D & C
15	*B. fragilis*, *K. pneumoniae*, anaerobic streptococcus, *E. coli*	Ampicillin	D & C
16	*B. fragilis*, *K. pneumoniae*, anaerobic streptococcus	Cefazolin	TAH, BSO
17	*B. fragilis*, anaerobic streptococcus	Ampicillin	D & C
18	*E. coli*	Ampicillin, gentamicin, clindamycin	BSO

*TAH = total abdominal hysterectomy; BSO = bilateral salpingo-oophorectomy; D & C = dilatation and curettage.

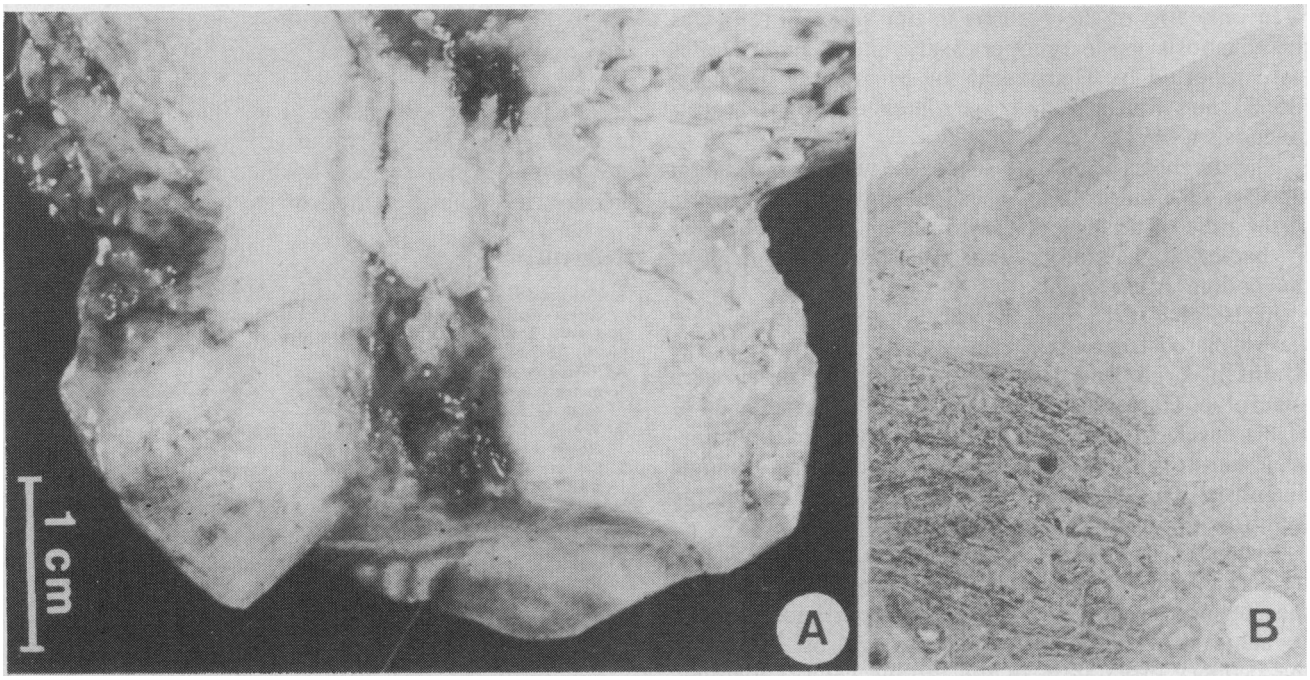

FIG. 2—A: obstruction of endocervical canal by plaque of hyalinized connective tissue. B: microscopic view of lesion, demonstrating absence of tumour (hematoxylin–eosin; × 100, enlarged 20%).

underwent laparotomy and bilateral salpingo-oophorectomy. Seven patients with cervical carcinoma underwent external irradiation with ^{60}Co followed by intracavitary insertion of cesium without complications.

Status at follow-up: Of the 15 patients who underwent dilatation and curettage 13 showed no evidence of recurrent pyometra in a follow-up period of 2 to 6 years. Two of the three patients with persistent cervical carcinoma died during the follow-up period; the other is alive with metastases.

Discussion

In a large proportion of cases pyometra is associated with or follows treatment of a malignant disease of the uterus.[1-4] The classic presenting signs and symptoms — postmenopausal bleeding, vaginal discharge, and uterine enlargement or cramps — suggest a uterine neoplasm or cervical obstruction and necessitate prompt investigation. Although the association between pyometra and uterine malignant disease is well documented,[2,3,8] some cases of pyometra associated with endometrial carcinoma are probably never diagnosed and the necrotic, inflamed tissue obtained at the time of curettage is considered to be part of the malignant endometrium.

In our series 7 of 18 patients with pyometra (39%) had carcinoma of the cervix, and another 5 (28%) had undergone radiotherapy for cervical carcinoma in the past (from 6 months to 16 years earlier). Another patient had a mixed mesodermal tumour of the uterus. Thus, 72% of the patients had a malignant lesion of the uterus or had received radiotherapy for cervical carcinoma. These figures are similar to those quoted by Stone and Winston.[2] The results of our review emphasize that pyometra is a potentially lethal late complication of radiotherapy.

In only two of the patients in our series (11%) was the diagnosis made preoperatively; much higher rates were reported by Henriksen[1] for preautopsy diagnosis (35%) and Shirholz and associates[3] for preoperative diagnosis (44%).

The diagnosis should be suspected when a significant amount of fluid is seen escaping through the cervix at the time of dilatation. Confirmation can be obtained by bacteriologic studies and histologic assessment of the endometrium.

In 10 of our 18 patients (56%) anaerobic bacteria were isolated from the uterine cavity, and 56% of the strains of organisms isolated in the entire series were anaerobic. Carter[9] isolated anaerobic bacteria in 34% of his cases. Mixed infection is common. Proper anaerobic cultures are mandatory for a precise bacteriologic diagnosis. The organisms isolated are those commonly found in the normal vaginal flora.[6,8,10]

Pyometra should be considered as an abscess and treated promptly and vigorously. Proper drainage of the uterine cavity is of paramount importance and can be achieved by dilatation of the cervical os. Following the primary evacuation of the uterine cavity, adequate drainage should be maintained either by leaving a drain in the uterine cavity or by repeatedly dilating the cervical canal if necessary. Curettage of the uterine cavity and endocervical canal after dilatation is essential to rule out associated malignant disease as well as to debride the necrotic tissue. Even though removal of the uterus in toto will eliminate the disease, this major procedure should be reserved as a second line of treatment and should be done only after associated abnormalities are ruled out and after the acute inflammation is controlled.

Antibiotics effective against aerobic and anaerobic bacteria should be given to all patients with signs of systemic infection, such as fever, peritonitis, tachycardia or leukocytosis, but only after appropriate specimens for culture have been obtained. Gram-staining may be of value in determining the possible causative organism and in selecting the antibiotics to be used initially. Combination therapy with gentamicin and clindamycin will be adequate in most patients. However, evacuation of the uterus remains the mainstay of management, and all 17 of the patients in our series whose uterine cavity was properly drained or whose uterus was removed in toto recovered, regardless of the type of antibiotic therapy. The patient in whom the nidus of infection was not removed or drained died despite adequate antibiotic treatment.

Once the infection is controlled, the underlying problem can be treated. If only senile endometrium is found, follow-up and periodic dilatation of the cervical canal are necessary to ensure adequate drainage of the uterine cavity. An estrogen cream may be applied locally if there is severe atrophy.

Radiotherapy is contraindicated in the presence of active pelvic infection,[9,11] for radiation will increase the amount of necrotic tissue, interfere with the defence mechanisms of the host and facilitate the spread of infection.[11] In cases associated with carcinoma of the uterine body or cervix, external radiation may be given when the infection is controlled or drainage secured, then may be followed by surgery or intracavity irradiation.[9,11]

Spread of the organisms from the uterus will lead to septicemia. The 80 reported fatal cases[1,7] and the one patient in our series who died of septic shock emphasize the lethal potential of pyometra.

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