

### Acalculous Cholecystitis and Cytomegalovirus Infection in a Patient with AIDS

COLLEAGUES—Blumberg [1] and Kavin et al. [2] described three cases of acalculous cholecystitis associated with cytomegalovirus (CMV) infection in patients with AIDS. Because these patients were chronically ill and because chronic illness can predispose the patient to acalculous cholecystitis, the authors were reluctant to implicate CMV infection as a primary pathogenetic mechanism. We have recently observed a similar case, in which the cholecystitis associated with CMV was the initial manifestation of AIDS.

A 33-year-old black heterosexual woman from Zaire was hospitalized with a one-month history of fever, weight loss, and pain in the right upper quadrant. Tenderness was present in the right hypochondriac region, and Murphy's sign was positive. Abdominal sonography showed marked thickening of the gallbladder, but no calculi. The serum levels of liver enzyme were slightly elevated. Complement-fixing antibodies to CMV were present in a stable titer of 1:8 in acute- and convalescent-phase serum. Cultures of blood and urine were initially negative for CMV, but became positive one month after admission. The total lymphocyte count was 550 cells/mm<sup>3</sup>, with a T4/T8 ratio of 0.4. Antibodies to human immunodeficiency virus (HIV) were present at a titer of 1:400 (ELISA; Institute Pasteur, Paris), and HIV infection was

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confirmed by western-blot analysis. A cholecystectomy was performed. No calculi were found. However, the gallbladder wall was markedly thickened and indurated, and the mucosa showed extensive erosions. Microscopically, the wall was infiltrated by lymphocytes, plasmocytes, and neutrophils. CMV inclusion bodies were present in endothelial and epithelial cells. After the cholecystectomy, the patient became asymptomatic. However, she was subsequently readmitted for herpes simplex virus and *Mycobacterium avium* infections, and the diagnosis of AIDS was thus established.

In support of the conclusion that CMV infection plays a primary pathogenetic role, this case shows that CMV infection can be associated with acalculous cholecystitis in the absence of other factors predisposing to the development of this disease. Therefore, patients presenting with acalculous cholecystitis should be evaluated for evidence of HIV infection.

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### *Staphylococcus aureus* Colonization in Intravenous Drug Abusers, Dialysis Patients, and Diabetics

COLLEAGUES—Intravenous drug abusers, insulin-dependent diabetics, and dialysis patients have been reported to have a higher rate of colonization with *Staphylococcus aureus* than have the general population [1-6]. It has been suggested that this rate results from the common use of needles by all three groups of patients [2].

We report the incidence of *S. aureus* colonization in groups of iv drug abusers and non-iv drug abusers (persons who denied using intravenous drugs) presenting to a hospital emergency room (ER), in dialysis subjects, in insulin-dependent diabetics, and in medical students. Because iv drug abusers have a high rate of infection with methicillin-resistant *S. aureus* (MRSA) [7-9], we also studied the rate of MRSA colonization in these groups.

Patients entering the ERs of the Manhattan Veterans Administration (MVA) Hospital and the Bellevue Hospital were questioned regarding the intravenous use of cocaine or heroin within the previ-

ous six months. Those who admitted such use formed the first study group. The second group consisted of an age-matched population of non-iv drug abusers who entered the same ERs. Patients from the hemodialysis units of the two hospitals formed the third group. The fourth group was comprised of insulin-using patients with diabetes mellitus who were seen in the outpatient diabetes clinics of the two hospitals. The fifth group was made up of second-year students at the New York University School of Medicine whose hospital exposure was limited to a weekly course in Physical Diagnosis. The iv drug abusers were interviewed about their use of drugs and antibiotics. Bacteriologic cultures were obtained from the hands, nose, and throat of all subjects. *S. aureus* was identified in the usual way. Methicillin resistance was determined by the Kirby-Bauer technique, using 1- $\mu$ g oxacillin disks. The phage type of all strains of *S. aureus* was determined at the New York City Department of Health. A  $\chi^2$  table was used to evaluate statistical significance.

One hundred iv drug abusers (all men) were cultured and interviewed in the MVA Hospital ER and 123 (100 men, 23 women) at the Bellevue Hospital ER. Fifty-seven of the 100 subjects from the MVA Hospital were colonized with *S. aureus* in either the hands, nose, or throat. At the Bellevue Hospital ER, 80 (65.0%) of 123 subjects were so colonized. Overall, 137 (61.4%) of 223 iv drug abusers were colonized with *S. aureus*. The two hospital

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populations differed in that approximately one-third of the iv drug abusers from the MVA Hospital were seeking admission to the detoxification unit and had no specific complaints, whereas all of the iv drug abusers from the Bellevue Hospital had specific complaints, many of them infections. No factor related to drug use influenced colonization rates. These factors included the frequency of drug use, time of last injection, sharing of needles, duration of use of the needle, and use of "shooting galleries." The use of nonprescription antibiotics also had no bearing on the rate of colonization.

One hundred and fifty non-iv drug abusers were seen in the MVA Hospital ER, and 72 (48.0%) were colonized by *S. aureus*; 52 (50.5%) of 103 such subjects at the Bellevue Hospital ER were colonized. Overall, 124 (49.0%) of 253 non-iv drug abusers were colonized. The prevalence of *S. aureus* colonization in non-iv drug abusers was lower than in the iv group ( $P < .01$ ). When the two hospitals were analyzed separately, however, the difference was significant only at Bellevue Hospital ( $P < .05$ ). *S. aureus* colonization was not significantly increased among non-iv drug abusers who were cocaine users, alcoholics, or diabetics.

Twenty-two (40.7%) of 54 dialysis patients were colonized with *S. aureus*, and 33 (46.5%) of 71 insulin-taking diabetics were colonized with *S. aureus*. Fifty-eight (50.0%) of 116 medical students had *S. aureus*. The sites of colonization for all groups are shown in table 1.

Among those subjects who were colonized with *S. aureus*, MRSA were isolated from 40 (29.2%) of 137 iv drug abusers, 7 (5.6%) of 124 non-iv drug abusers, 5 (22.7%) of 22 dialysis patients, 6 (18.2%) of 33 diabetics, and 3 (5.2%) of 58 medical students. The difference in MRSA colonization between iv and non-iv drug abusers was highly significant ( $P < .001$ ). Dialysis patients and diabetics also exhibited a higher rate of colonization with MRSA than did the non-iv drug abusers ( $P < .01$ ). The distribution of phage types was similar in all the study groups. The phage types of resistant strains among iv drug abusers varied. Four of the seven non-iv drug abusers with MRSA infections shared a common phage type (94/96) that was also shared by three of the six diabetics, one of the five dialysis patients, and all three of the medical students with MRSA infections.

Intravenous drug abusers, dialysis patients, and diabetics are predisposed to *S. aureus* infection of different types. Intravenous drug abusers are at risk for acute bacterial endocarditis, skin abscesses, and cellulitis as a direct result of their use of needles; dialysis patients are subject to fistula infections and bacteremias; and diabetics suffer from soft-tissue infections related to peripheral-vascular disease and peripheral neuropathy. A high incidence of colonization with *S. aureus* in these groups has been thought to contribute to these infections.

Kirmani et al. [2] postulated that the common use of needles was responsible for the high rate of colonization with *S. aureus* in these three groups. The observation that only iv drug abusers who had used drugs within a week of being cultured had a higher rate of colonization with *S. aureus* than did the control group supported this hypothesis. We found no increase in colonization with *S. aureus* among iv drug abusers who used drugs within a week compared with those who had not used drugs for a longer period. The frequency of drug use, needle sharing, and use of "shooting galleries" also had no bearing on the rate of colonization. Furthermore, we found a higher rate of *S. aureus* colonization only among iv drug abusers from Bellevue Hospital, where many presented with *S. aureus* infection and so formed a select group likely to be colonized [7-8, 10]. At the MVA Hospital ER, where many of the iv drug abusers were seeking admission to the detoxification unit and had no specific medical complaints, an increased rate of *S. aureus* colonization was not found. It is likely, therefore, that uninfected iv drug abusers do not have an increased rate of colonization by *S. aureus*, as compared with non-iv drug abusers.

Tuazon et al. [6] reported that 12 of 35 insulin-taking diabetics were colonized with *S. aureus*, compared with four of 36 diabetics not taking insulin. We cultured larger groups of insulin-dependent, outpatient diabetics and controls and found the same rate of *S. aureus* colonization in each. In an earlier study [5], which showed a high rate of colonization with *S. aureus* among diabetics, it was not clear whether the diabetics were inpatients or outpatients. Three studies [2-4] also showed that hemodialysis patients had an increased rate of *S. aureus* colonization. We did not find, by using larger groups of subjects and controls, an increased rate of *S. aureus* colonization in our dialysis patients.

The high rate of MRSA among iv drug abusers was expected because of the observed high rate of community-acquired MRSA infections among iv drug abusers at our hospital. The high rate of MRSA infections among dialysis patients and diabetics was not, however, anticipated. It is possible that these patients were treated with antibiotics more often than is the general population. We doubt that exposure to the hospital flora was an important factor in acquiring *S. aureus* by these patients, because none were colonized with MRSA of the experimental phage type 88, which was responsible for the largest number of nosocomial infections in our two hospitals.

In summary, we found that non-infected iv drug abusers, insulin-dependent diabetics, and dialysis patients had the same rate of carriage of *S. aureus* as had non-iv drug abusers and medical students. This finding suggests that needle use is not a factor in acquiring *S. aureus*. MRSA was, however, more common in iv drug abusers, insulin-dependent diabetics, and dialysis patients

**Table 1.** *S. aureus* colonization rates.

Subjects (no. studied)	Site of isolation							Total
	H	N	T	HN	NT	HT	HNT	
IVDAs (223)	33 (15)	31 (14)	4 (2)	54 (24)	4 (2)	2 (1)	9 (4)	137 (61)
Non-IVDAs (253)	34 (13)	29 (12)	4 (2)	43 (17)	4 (2)	1 (0)	9 (4)	124 (49)
Dialysis patients (54)	3 (6)	4 (7)	0 (0)	14 (26)	0 (0)	1 (2)	0 (0)	22 (41)
Insulin-dependent diabetics (71)	5 (7)	7 (10)	0 (0)	17 (31)	0 (0)	0 (0)	3 (4)	33 (46)
Second-year medical students (116)	8 (7)	19 (16)	4 (3)	24 (21)	1 (1)	1 (1)	1 (1)	58 (50)

NOTE. IVDAs, iv drug abusers; H, hand; N, nose; and T, throat. Data are the no. of isolates (%).



than among the other groups studied. The finding of MRSA colonization in non-iv drug abusers and pre-clinical medical students suggests that MRSA infection may become more widespread in the general population.

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#### Occlusive Dressings and Wound Infection

COLLEAGUES—Many studies during the last decade have shown that occlusive wound dressings can accelerate healing of chronic skin wounds induced, for example, by poor circulation [1, 2]. From theoretical and practical standpoints, adverse effects were expected with the use of occlusive dressings on diabetic and other ulcers because bacterial growth may be enhanced underneath these dressings [3].

We have recently carried out a series of experimental wound infections in a pig model, which support these clinical observations [4]. It is difficult to establish streptococcal and above all staphylococcal infections in normal skin without using foreign bodies [5]. This creates a great problem for evaluating various kinds of dressings because the experimentally infected wounds heal rapidly. By applying occlusive wound dressing (Duoderm®; Convatec-Squibb, Princeton, NJ) on the freshly infected wounds, we obtained suppurating wound infections within a day or two with strains of both group A *Streptococcus* and *Staphylococcus aureus*. Control wounds with conventional or hydrophobic wound dressings had then already started to heal [4].

Most animals have a high natural resistance to experimental bacterial infections, and application of *S. aureus* was even shown to accelerate wound healing in the rat [6]. The young pig has a skin very similar to human skin and was hence chosen as the experimental animal. Application of Duoderm was the most reproducible way to get 16-20 similarly infected wounds on the dorsum of each animal. In this model we compared the effects on healing of Debrisan® (Pharmacia, Uppsala, Sweden), Actisorb®

(Johnson & Johnson, New Brunswick, NJ), and Sorbact 10<sup>50</sup>® (LIC, Solna, Sweden), a new hydrophobic dressing [4]. Absorption of pus and bacteria and drying out of the wounds with these absorptive dressings permit the natural healing process to start early, whereas occlusive wound dressings create a microenvironment that allows the pathogens to multiply in a moist atmosphere and stimulates local spread of the infection. Experiments in wounds sealed with surgical tapes confirm that the sealing process allows the infection to establish itself [7]. Likewise, studies in volunteers show that pathogens readily multiply on normal skin in a humid chamber created by sealing with impermeable plastic tapes.

Mertz et al. [1] have recently demonstrated that occlusive wound dressings prevent bacteria from entering wounds covered by occlusive dressings, and Varghese et al. [2] have shown that chronic, probably uninfected wounds heal faster underneath these dressings. Katz et al. [8], however, compared six semi-occlusive dressings in a clinical study and found that bacteria readily multiply underneath the dressings and that none of the dressings prevented infections with streptococci, staphylococci, or *Pseudomonas aeruginosa*.

We are not aware of warnings about the use of occlusive wound dressings on infected wounds. It seems likely that wounds colonized by potential pathogens but without symptoms of infection may progress into an infection if such wounds are covered by occlusive dressings. From our experimental studies, we want to recommend that bacterial cultures are taken before therapy is started, particularly in patients with clinical signs of infection, in patients prone to develop skin infections, and in patients with pyoderma-like diabetes.

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