The Value of Needle Aspiration in the Management of Cellulitis

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Needle aspirations from 103 young, healthy patients (mean age 22 years) with cellulitis were prospectively analyzed to determine the percentage yield and causative organisms. A standard technique of needle aspiration was performed using a 22-gauge needle, a 10-cc syringe, and 1 cc of sterile water. Aspirations were performed at the leading edge and midpoint of the cellulitis (halfway between the leading edge and the center of the cellulitis). Fifteen of the 103 patients (14.5 percent) had positive aspirates. Nine of the 103 aspirates were positive at the leading edge (8.7 percent) and 6 of 70 were positive at the midpoint (8.6 percent), giving a total aspiration positivity of 8.7 percent (15/173). The organisms recovered were Staphylococcus aureus (53 percent), Staphylococcus epidermidis (27 percent), α-hemolytic streptococci (13 percent) and Streptococcus pyrogenes (7 percent). The low-percentage yield and predictable organisms recovered speak against needle aspiration being a necessary procedure in a young, healthy population. Similarly, the site of aspiration does not increase yield. Empiric treatment with antibiotics aimed at staphylococcal and streptococcal organisms is appropriate.

Cellulitis is an acute infection of the skin and its underlying subcutaneous tissue commonly encountered by primary care physicians. Despite its frequency, however, the diagnosis and treatment remain empiric. Both the difficulty in isolating the etiologic agent and the lack of sound medical research to support a diagnostic approach have placed the clinician in a position of uncertainty.

Several authors have recommended needle aspiration as the diagnostic procedure to identify the causative organisms in cellulitis.[1-4] This procedure is not universally accepted as useful, however,[5,6] and, even among the advocates, the best location for needle aspiration is controversial.[7] The medical literature concerning needle aspiration in cellulitis is also vague, demonstrating a wide range of positive aspiration rates from a low of 4 percent to a high of 67 percent.[1-10] Amid this confusion and controversy, this study was undertaken to determine the utility of needle aspiration in the diagnosis of cellulitis.

METHODS

Martin Army Community Hospital (MACH) is a 227-bed teaching hospital that serves the active duty, retired, and dependent population of approximately 100,000 people at Fort Benning, Georiga. Patients diagnosed as having cellulitis between November 1, 1984, and September 4, 1985, were included in this study. Each patient had pertinent history, physical examination, complete blood count with differential, sedimentation rate, blood culture, wound culture (if drainage was present), and needle aspiration(s) performed. The only exclusion criterion was for patients on antibiotics at the time of evaluation.

A standardized technique of aspiration was performed on all patients. This procedure consisted of cleaning the leading edge with povidone-iodine (Betadine) and allowing the area to dry. Alcohol was then used to wash off the iodine and again allowed to dry. One cubic centimeter of nonbacteriostatic sterile water

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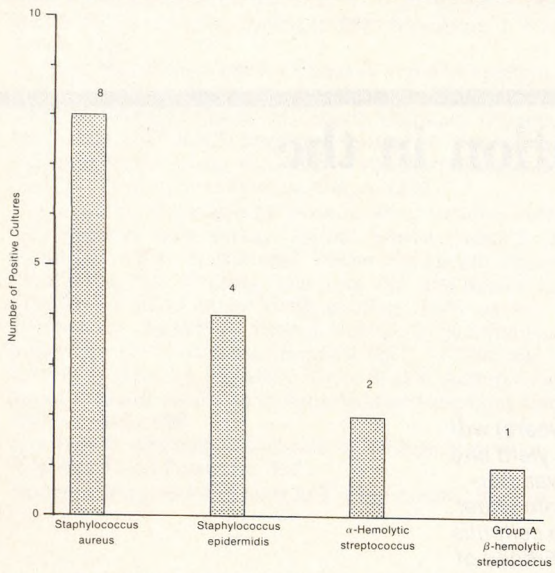

Figure 1. Bacteria recovered from needle aspiration cultures

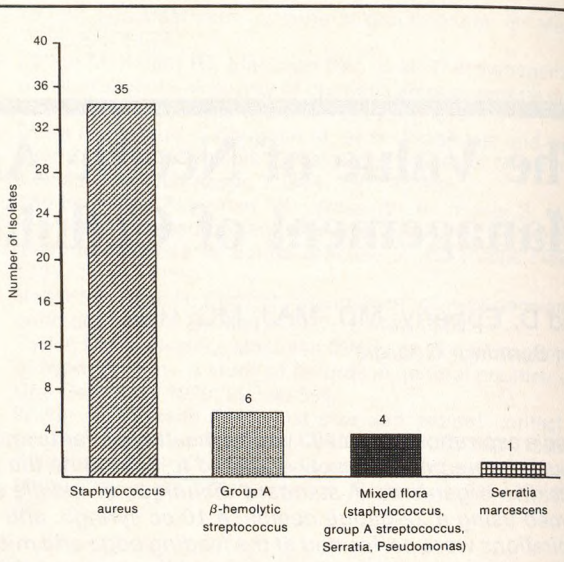

Figure 2. Bacteria recovered from wound cultures

was drawn into a 10-cc plastic syringe and a 22-gauge needle placed on the syringe. The needle was inserted into the skin at the leading edge of the cellulitis and the entire 1 cc of sterile water was injected. Vigorous aspirations followed with return of at least serosanguinous fluid as the end point of the aspiration. In 70 patients a second aspiration was performed midway between the leading edge and the center of the cellulitis (midpoint aspiration) using the same technique with a separate sterile needle, syringe, and water.

The aspirates were placed on sterile cotton-tipped culturettes and promptly taken to the MACH laboratory. In cases in which a draining wound or abscess was present, cultures were also obtained and sent.

Statistical analyses were done using Student's *t* test, and results were considered significant at $P < .05$.

RESULTS

There were 103 patients with cellulitis in this study. They ranged in age from 7 to 70 years with the mean age being 22 years. Ninety-five patients were male and 8 were female.

Fifteen of 103 patients (14.5 percent) had positive aspirates. Nine of the 103 aspirates (8.7 percent) were positive at the leading edge and 6 of the 70 aspirates (8.6 percent) were positive at the midpoint. Therefore, of the 173 total aspirates performed (103 leading edge and 70 midposition), 15 were positive, giving a total aspirate positivity of 8.7 percent. There were no cases where both the leading edge and the midpoint aspiration were positive.

The bacterial causes of the 15 positive aspirates are graphed in Figure 1.

Forty-seven wound cultures were done in this study. Forty-six of 47 (98 percent) were positive. The organisms recovered from the wound cultures are listed in Figure 2. Staphlococcus aureus (76 percent) and Streptococcus pyogenes (13 percent) were the predominant organisms.

The average white blood cell count, differential, erythrocyte sedimentation rate, temperature, and their respective ranges are listed in Table 1. There were no statistically significant differences in these parameters between patients with cellulitis that were aspirate-positive and those with cellulitis that were aspirate-negative.

Eighty-seven blood cultures were done in this study, and three were positive (3.4 percent). The organisms retrieved were Bacillus species twice and Staphylococcus epidermidis once. All three were considered contaminant by the author, and the patients recovered uneventfully.

Anatomic areas involved with cellulitis were lower extremities (72 percent), upper extremities (19 percent), trunk and buttocks (8 percent), and face (1 percent). It is of particular note that the foot, leg, and knee were the most common sites of cellulitis in this population.

DISCUSSION

Review of the existing literature on needle aspiration reveals a marked discrepancy in results with nine studies having positive aspiration rates ranging from 4 percent to 67 percent.[1,3-6,8-11] This wide range of aspi-

TABLE 1. LABORATORY STUDIES AND TEMPERATURE SUMMARY

	Cellulitis Patients (Average) n = 103	Range	Aspirate-Positive Group (Average) n = 15	Aspirate-Negative Group (Average) n = 88	Statistical Significance Between Aspirate-Positive and Aspirate-Negative Groups
Total white blood count	11.8 × 10^3/mL	6.6 – 24.2 × 10^3/mL	11.6 × 10^3/mL	11.82 × 10^3/mL	$P > 0.5$
White blood count differential (polymorphonuclear leukocytes and band cells)	75.5%	53-95%	73.1%	74.9%	$P > 0.5$
Erythrocyte sedimentation rate	20.3 mm/h	1-94 mm/h	24 mm/h	19.7 mm/h	$P > 0.5$
Oral temperature	98.7°F	96 – 103°F	98.74°F	98.68°F	$P > 0.5$

rate positivity is disconcerting and cannot be totally explained by the difference in population (pediatric vs adult), difference in aspiration technique, study size, or study design (prospective vs retrospective).

This study reports the largest collection of cellulitis patients published and is only the third study done prospectively on adults. The positive aspiration rate of 8.7 percent is consistent with the two previous prospective studies of adult cellulitis, which demonstrated aspiration positivity of 4 percent and 11 percent.[8,9] The pediatric studies tend to yield higher aspiration rates,[1,4,10] perhaps in part due to the greater virulence and culturability of Hemophilus influenzae in the pediatric population.

One may wonder why needle aspiration results are so poor. The answer may come from some research done by Drinker and Field[12] in 1935. In their study dogs with induced chronic lymphedema were subjected to recurrent attacks of streptococcal cellulitis. They found that needle aspiration would yield the streptococcus organism if done prior to 12 hours after the onset of cellulitis. If done after this time, despite the continued presence of signs, aspirates would be negative. These findings may be clinically applicable, since patients with cellulitis rarely present within 12 hours of onset. Most patients present 24 to 48 hours after onset of symptoms and signs.

The site of needle aspiration in cellulitis has also been controversial. Most physicians aspirate the leading edge, but some physicians[7] believe that this area is not the most effective, as it is often edematous but not infected. Likewise, they feel aspiration from the center of the cellulitis harbors nonviable organisms. It is their conclusion that a site halfway between the leading edge and the center of the cellulitis will give the best results. This midpoint aspiration was analyzed in 70 patients in this study. Six of these 70 patients (8.6 percent) had positive aspirates at the midpoint of the cellulitis.

This percentage compares with 9 of 103 patients (8.7 percent) being positive at the leading edge. This difference is not statistically significant and refutes the idea that midpoint cellulitis aspiration yields higher culture rates.

The organisms cultured by aspiration were expected. These bacteriologic data help support three ideas: (1) that the organisms found in the wounds are similar to those aspirated from the cellulitis areas, (2) that these organisms represent common pathogens in a young, healthy population, and (3) that wound culture rates provide a much higher yield than cultures of aspirated material (98 percent vs 8.7 percent). Ho and Pien[13] found that 86 percent of acute cellulitis wound cultures in adults were positive.

The data demonstrate that patients with cellulitis have a mild leukocytosis with left shift. Similarly the erythrocyte sedimentation rate is mildly elevated. The presence or absence of fever does not seem to be an indicator of cellulitis. There were no statistically significant differences in these values between the aspirate-positive and aspirate-negative subgroups (Table 1).

Blood cultures were not helpful and are not cost effective in this population. This conclusion is supported by two previous studies that revealed one positive blood culture in 157 combined sets of blood cultures done.[6,13]

In conclusion, needle aspiration is a procedure with a diagnostic yield of 8.7 percent in a young, healthy, adult population. The low rate of positivity and the predictability of the organisms recovered suggest that aspiration is unnecessary in this population. It is recommended that patients with cellulitis be treated empirically with an appropriate antibiotic that covers both staphylococcal and streptococcal organisms.

Similarly the routine usage of complete blood counts, erythrocyte sedimentation rates, and blood cultures are unwarranted. Draining wounds or ab-

scesses may be cultured with very high yield, and this procedure is preferred to aspiration whenever possible.

Such high-risk groups as immunocompromised patients and elderly patients will need further studies to determine whether this approach is also appropriate.

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