EXPERIENCE WITH ANODIC SILVER IN THE TREATMENT OF OSTEOMYELITIS

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The need for adequate local therapy in the management of osteomyelitis and the limited effectiveness of systemic antibiotics have led us to consider the use of electro- chemically released silver ions as an antibacterial agent. Previous in vitro (1,2) and in vivo (3) studies had demonstrated that anodic silver is effective against a broad spectrum of bacteria at lower concentrations than most antibiotics (2). Partially due to the absence of exogenous anion, it appears relatively safe to normal tissue. Our initial experience with 14 patients with various lesions was gratifying in that, in all but cases, the wounds healed with no drainage at from 6-36 months follow-up. Of the 3 failures, 2 were markedly Improved and achieved bone union.

The silver electrode was used in two forms: a) silver-impregnated nylon fabric and b) pure silver wire. The first was used in patients with open, draining wounds, requiring debridement of infected bone and soft tissue. After removal of dead bone, insuring adequate drainage and immobilization, the silver-nylon was packed into the wound, contacting all surfaces and covered with a moistened stent and then dry sterile dressings. A portion of the nylon, left emerging from the dressings, was connected to the positive lead of a 0.9 volt constant-voltage source. The return lead was connected to a carbon-silicone rubber skin electrode on the same limb. Treatment was continuous for the first 2-4 days post-op and daily for 3 hours thereafter. Open irrigation with dilute H_2O_2 solution at hour intervals (dressing change) was also used. Systemic antibiotics were used for a maximum of 7 days after surgery to prevent soft tissue Infection and bacteremia.

The silver wire electrode was used in cases of infected non-unions which could be surgically closed. The wire was inserted directly into the fracture site, the length of the non-insulated portion being determined by the extent of the non-union and method of placement. After being led out through a stab incision in the skin and through the cast, this lead was attached to the positive lead of constant-current source delivering 1-2 μA/cm of exposed 22 AWG silver wire. The return lead was as above. Current was applied continuously for 48-72 hours after surgery after which the same lead was re-connected as a cathode for electrical osteogenesis, its antibacterial function completed, but available if needed again (4).

TABLE 1.: RESULTS OF 14 PATIENTS WITH OSTEOMYELITIS USING SILVER ANODE LOCAL THERAPY (6-36 MONTH FOLLOW-UP).

Rx	CASE TYPE	No.	BONE HEALED	NO DRAINAGE
(a) 'OPEN' DEBRIDEMENT + Ag-NYLON	INF. NON-UNION, TIBIA	5*	5	5
	INF., TIBIA	3	—	3
	INFL. TOTAL HIP	1	1	0
	PYARTHROSIS, KNEE	1	1	1
(b) 'CLOSED' DEBRIDEMENT + AG-wire	INF. NON-UNION, TIBIA	5	4	3
	TOTAL ATTEMPTS	15		
	NET RESULT		11/12	12/15

* One patient, successfully treated with saucerization and Ag-nylon after an unsuccessful attempt with Ag wire and more conservative debridement, thus appears twice.

Results thus far are outlined in Table 1. The patients in this study presented at the orthopedic service and were not solicited. They had resistant infections of long standing in general and had one or more courses of antibiotic therapy before the silver therapy/surgical program. No patient treated in this way was eliminated from this report. Although the group is small and no control therapies were used (except for the general experience with such cases), it appears that electrically released silver is an effective local antibacterial agent. When combined with good surgical care, it may be at least as good as conventional local treatments and seems compatible with healing tissue, unlike some harsh agents in common use. In addition it offers a broad spectrum of activity and may be retained in local tissues a longer time. The techniques are simple and, in most cases, the patients were able to perform their own post-surgical treatments and dressing changes.

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