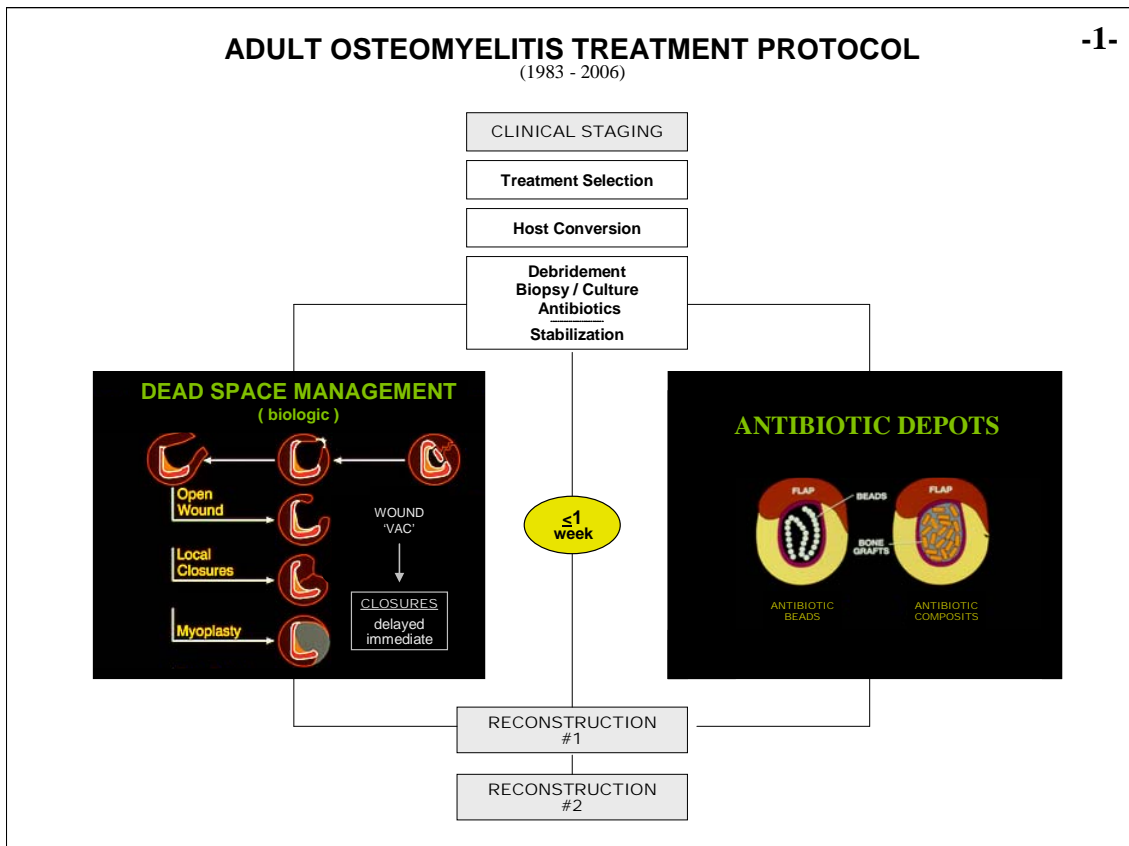


ADULT OSTEOMYELITIS PROTOCOL (San Diego – 2006)

In the last 25 years, over 3,000 patients with refractory long bone infections have entered our prospective studies to assess the anatomic and the physiologic parameters of adult osteomyelitis. Patient selection has been based on the Cierny/Mader, *Clinical Staging System for Adult Osteomyelitis*. In this system, four factors are used to align treatment with a realistic prognosis: the site of the infection, the extent of the disease, the condition of the host, and functional goals (see OSTEOMYELITIS).



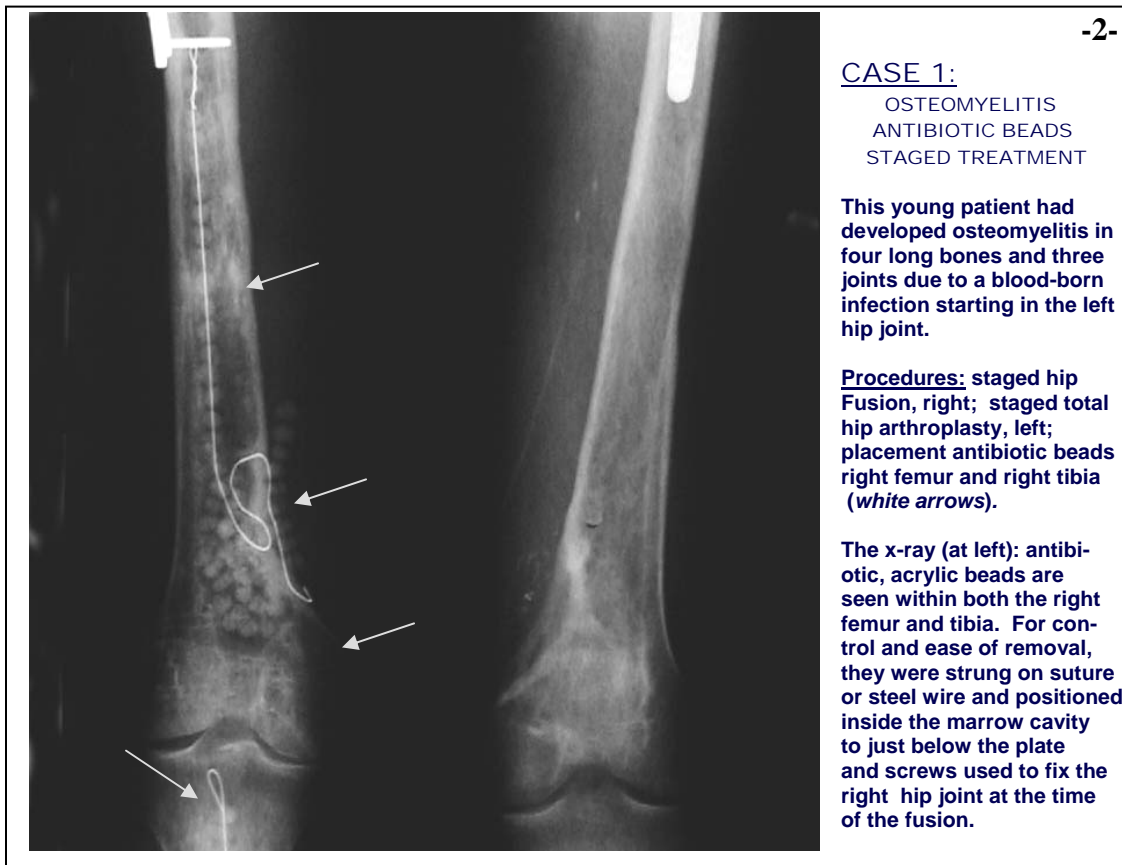
There are three treatment formats: limb salvage, amputation or palliation. To maximize outcomes (*host rescue*), host factors that will negatively affect treatment and wound healing (co-morbidities) are amended, beforehand. At surgery, all diseased tissue, foreign bodies and surgical implants are excised. Systemic antibiotics are initiated after biopsies are sent for culture and histologic evaluation. The wound is then flushed with clean fluids and assessed for closure.

Antibiotics are the mainstay of treatment of acute compared with chronic osteomyelitis which requires a staged approach: initial clearance then followed by reconstruction.

Antibiotic Depots: BEADS, SPACERS, GELS, PROSTALAC JOINTS

Following debridement, most wounds were, until recently, left 'open' to either heal spontaneously or undergo a 'delayed' closure, when safe and the risk for infection was low. In **1983**, wound care was greatly facilitated with the introduction of locally-implanted, antibiotic depots. First, came the use of antibiotic-impregnated, acrylic bone cements in the salvage of infected total joint arthroplasties. Later, these cements were modified for implantation into debrided wounds in the form of 7.0mm beads; the high surface-to-volume ratio of the beads favored high, prolonged elution rates and local antibiotic concentrations 50x to 100x higher than ever achieved, previously. When used in conjunction with systemic therapy and a thorough debridement, antibiotic beads could render the wounds clean and ready for reconstruction reliably and quickly (weeks). *For the first time in medical history, it was safe to close an infected wound right after its debridement.*

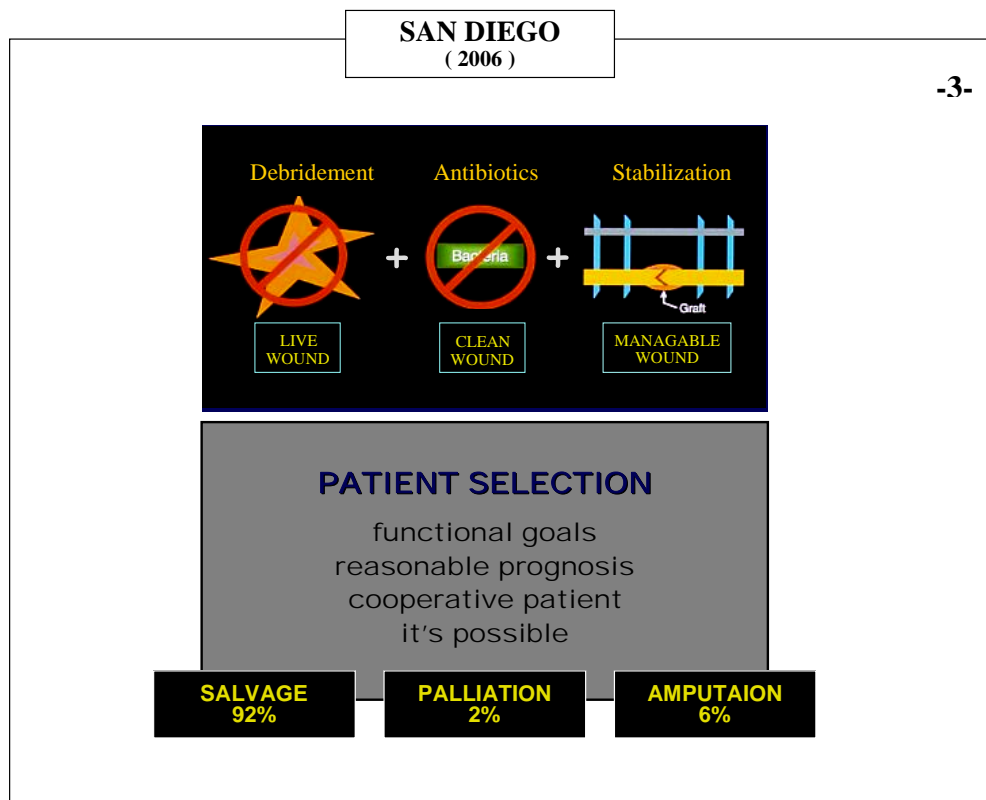
With time, the morbidity of treatment dropped, precipitately and limb salvage became available to many, who, until that time, heard only "amputation" from care givers. By **1998**, less than 4% of our patients left the surgery suite with an open wound and patients were discharged in days rather than weeks. The duration of systemic antibiotic therapy dropped below 2 weeks in 9 out of 10 protocols and the success rates increased, steadily, with time and experience.



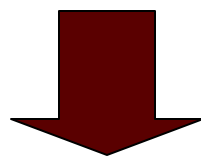
Staged protocols: OPEN FRACTURES, INFECTED NON-UNION, TOTAL JOINT INFECTIONS.

By 1986, our research on 364 consecutive patients confirmed the hypothesis: **“following a thorough wound debridement, antibiotic beads will reliably convert an infected wound to a clean wound.”** By 1994, two-stage protocols were a reality: antibiotic beads were implanted into wounds following debridement and coverage; reconstruction was performed one to 6 months later using “clean wound” constructs. The methods were expanded to include the treatment of open fractures, infected fractures, infected non-unions and peri-prosthetic total joint infections. New depot devices were gradually introduced to facilitate care and improve the quality of life for those undergoing treatment: block-spacers, bio-degradable beads, smart-gels, fiber-metals, and whole prosthetic joints made from impregnated materials (articulated spacers).

Reconstruction: With success rates as high as 95%, there were fewer amputations (*figure 3*) and more options to consider for salvage: bone transplants (allografts), deformity correction, limb lengthening (see, ILIZAROV), whole-bone replacements, mega-prosthetic total-joint arthroplasties.



Treatment of Chronic Infection. Cierny III,G, DiPasquale, D; in symposium, **Extremity War Injuries: State of the Art and Future Directions.**: JAAOS; Vol. 14, No. 10, pp105-110, 2006.



TREATMENT PROTOCOL (REOrthopaedics, Inc., San Diego)
(adult osteomyelitis)

I. MEDICAL HISTORY

previous culture/sensitivities	antibiotic regimes
mechanism of injury	surgical procedures
allergies	medications

II. HEALTH / FUNCTIONAL STATUS

co-morbidities	functional status
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III. CLINICAL STAGE OF OSTEOMYELITIS (Cierny/Mader: 1985, 2003)

Anatomic type: I -medullary, II -superficial, III -localized, IV -diffuse
Physiologic class: A -Host, B -Host, C -Host

IV. TREATMENT FORMAT

limb salvage	palliation (no Tx for cure)
amputation/ limb salvage	amputation

V. PRE-OP TESTING

lab values	diagnostic tests
aspiration / biopsy	(angiogram, ultra-sound, oxygen levels)
radiology (MRI, CT, Nuc. Scans)	

VI. HOST RESCUE

treat amenable co-morbidities	surgery: restorative (vasc. bypass, soft tissue)
hyperbaric oxygen treatment	systemic antibiotics

VII. 1st SURGERY

(A) debridement/ cultures/ biopsy	initiate systemic antibiotics
dead space management	
open wound.... open-bone transport (Ilizarov)....Wound 'VAC' protocols	
delayed primary closures (free or local flaps)	
local flaps	
antibiotic depots (beads, spacers, gels)	

(B) debridement/ cultures/ biopsy	initiate systemic antibiotics
<i>DOUBLE SET UP</i>	
temporary fixation	
dead space management	
open wound +/- wound 'VAC'..... delayed primary closures (free or local flaps)	
local flaps	
antibiotic depots (beads, spacers, gels, impregnated-implants)	

VIII. OUT PATIENT FOLLOW UP

wound healing	complications
lab values (ESR, CRP, albumen)	rehabilitation

IX. 2nd SURGERY

(A) initiate systemic antibiotics
debridement/ cultures/ biopsy

DOUBLE SET UP

(B) if wound infected or biopsies come back suspicious

(C) final reconstruction

bone grafts

internal fixation

prosthetic implants

antibiotic depots

X. OUT PATIENT FOLLOW UP

ESR, CRP (3mos)

bi-yearly checkups x 2