

CHRONIC OSTEOMYELITIS IN THE ADULT: FEATURES AND MEDICO-SURGICAL MANAGEMENT

EPIDEMIO-CLINICAL

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1. INTRODUCTION & BACKGROUND

The Challenge of Chronic Osteomyelitis (COM)

Chronic osteomyelitis of long bones is defined as a prolonged or recurrent bone infection, characterized by the persistence of devitalized bone tissue (sequestrum) and the development of a structured bacterial biofilm within poorly vascularized compartments [1, 2]. Due to the lack of effective local blood supply, systemic host defenses and antimicrobials fail to penetrate the infection site, making spontaneous resolution impossible [2, 3]. COM imposes a substantial socio-economic and clinical burden, leading to prolonged hospitalizations, repeated surgical interventions, and long-term functional impairment or even amputation [1, 8]. In Tunisia, patients often present with severe, chronic bone lesions at advanced stages. Historically, the foundation of COM treatment at the Mohamed Kassab Institute of Orthopedics (IMKO) was established in 1985 by Dr. Nouredine Sassi, evaluating the open bone grafting technique pioneered by Roy-Camille and Papineau [5]. However, standardizing local dead-space management and empirical antibiotic protocols remains a major clinical challenge [8, 10].

2. STUDY OBJECTIVES

- To describe the epide-clinical, radiological, and microbiological features of adult COM over a 10-year period (2013-2022) at the Mohamed Kassab Institute of Orthopedics (IMKO).
- To evaluate the efficacy of various medical-surgical techniques used for dead-space reconstruction and skin coverage.
- To identify independent prognostic factors of treatment failure and recurrence to optimize local clinical algorithms and standard procedures.

3. PATIENTS & METHODS

Study Design & Patient Cohort

A retrospective descriptive and analytical study of adult patients treated for COM over a 10-year period (January 2013 to December 2022) at IMKO. Out of 58 patients initially screened, 36 cases met the strict inclusion criteria and were followed for a minimum of 12 months post-operatively [8, 9].

Inclusion & Exclusion Criteria

Adult patients ($\geq$ 18 years) with a confirmed diagnosis of COM were included [1, 2]. Patients with bone infections following contiguous spread from adjacent tissues, open fractures, surgical implants, or direct inoculation from trauma were excluded to isolate hematogenous or pure primary osteomyelitis observations [3, 9]. All patients were staged using the Cierny-Mader and BACH scoring systems [3, 9].

Statistical Computation (SPSS)

Computed using SPSS version 26.0. Categorical variables were summarized as frequencies and percentages, compared via Pearson's Chi-Square or Fisher's Exact test. Means were compared via Student's t-test or ANOVA. The significance threshold was set at p-value $<$ 0.05 [8].

4. CLINICAL & MICROBIOLOGICAL RESULTS

Demographics & Comorbidities

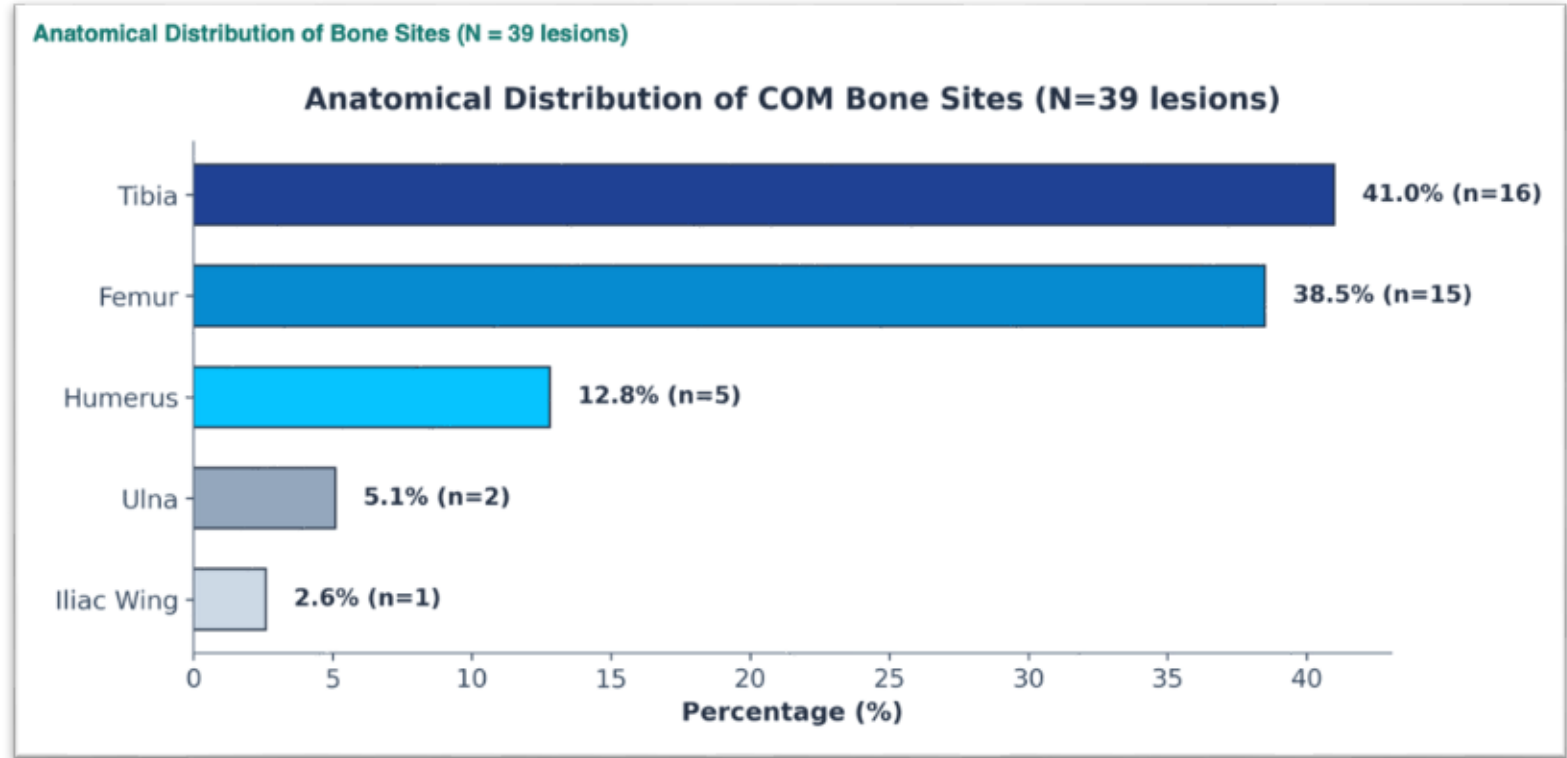
The study cohort comprised 36 patients, showing a high male predominance with 28 males (78%) and 8 females (22%), resulting in a sex-ratio of 3.5 [4]. The mean age was 44 ± 17 years. The median age at the first COM episode was 20 ± 13 years, with patients experiencing an average of 3 prior septic flare-ups before admission. Active smoking was reported in 14 patients (39%), obesity (BMI $\geq$ 30 kg/m²) in 17 patients (47.2%), type 2 diabetes in 5 patients (14%), and chronic kidney disease in 5 patients (14%) [4, 8].

Clinical Diagnostic Workup & Imaging

The diagnostic triad was highly consistent: local bone pain was present in 92% of patients, followed by localized swelling (69%) and active, purulent productive sinus tracts (64%). CRP $\geq$ 20 mg/L was found in 61.1% of patients (median CRP: 51 mg/L). Standard radiographs revealed medullary osteolysis in 94% of cases and sequestra in 67%. Preoperative CT Scans significantly improved mapping, detecting sequestra in 69%, fistulous tracts in 58%, and deep tissue abscesses in 53% [3,8].

Microbiological Profile & Pathogens

Peroperative bone cultures were positive in 94% of cases (30/32), with monomicrobial infection in 63% and polymicrobial in 37% [11]. Methicillin-susceptible Staphylococcus aureus (MSSA) was the predominant pathogen (44.0%), confirming the strong staphylococcal dominance reported in the literature [11].



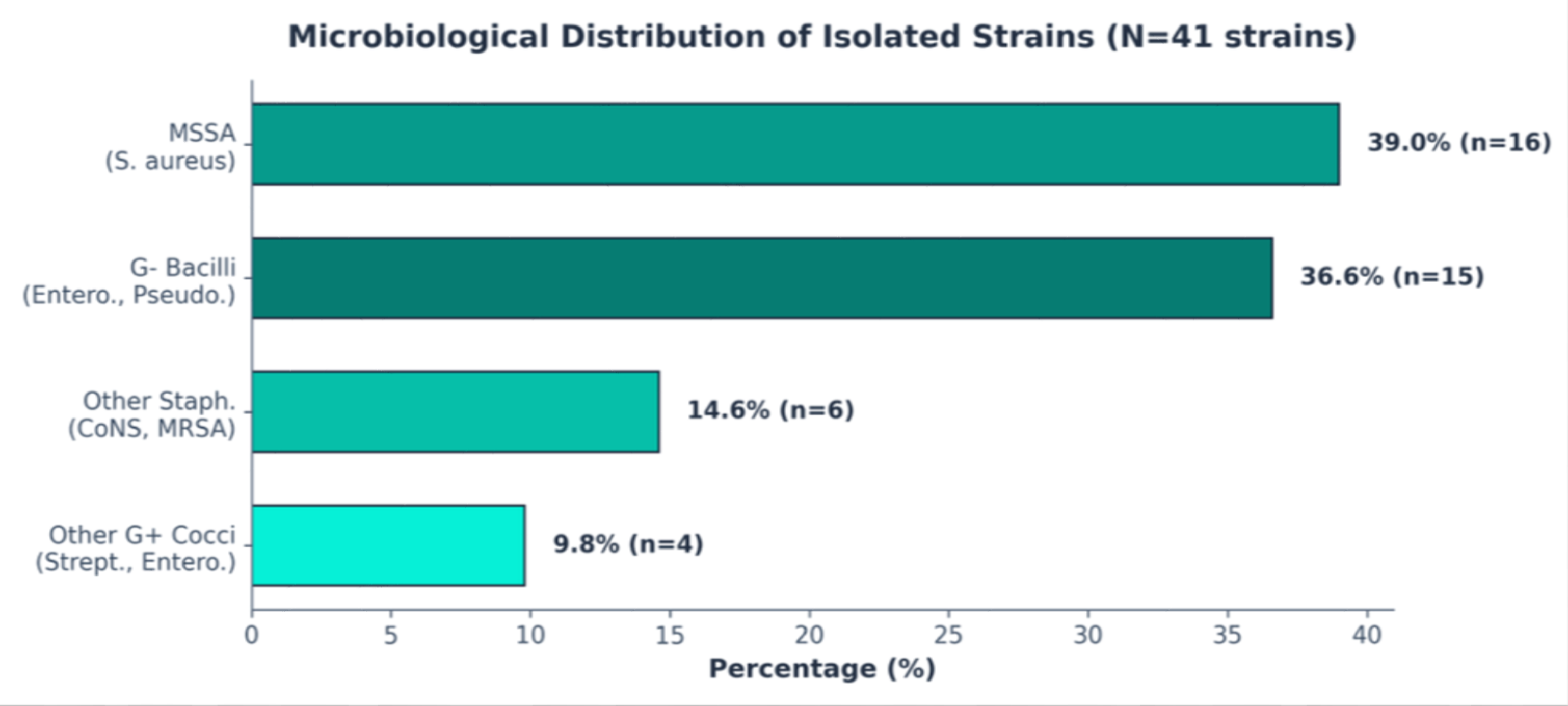
5. PROGNOSTIC FACTORS & STATISTICAL ANALYSIS

Bivariate analysis identified several key clinical, radiological, and surgical parameters significantly associated with treatment failure and non-remission (SPSS, p-value $<$ 0.05). Patients classified as Cierny-Mader Types 4B and 4C accounted for 55.5% of treatment failures [3, 8].

Table I: Bivariate Statistical Analysis of Prognostic Factors

Prognostic Risk Factor (SPSS)	Group N (Fail)	Group R (Healed)	p-value
Mean number of prior septic flare-ups	4.89 $\pm$ 2.67	2.96 $\pm$ 1.34	0.007
Active tobacco smoking	66.7%	29.6%	0.048
Preoperative deep abscess on CT	78.0%	44.0%	0.048
Pathogens other than MSSA	57.0%	22.0%	0.049
Inadequate dead-space (Reaming only)	11.0%	0.0%	0.048
Type 2 diabetes mellitus	33.3%	7.4%	0.050

Microbiological Distribution of Isolated Strains (N = 41 strains)



6. CONCLUSIONS & CLINICAL IMPLICATIONS

Surgical Reconstruction & Dead-Space Algorithm

The choice of surgical technique is guided by Cierny-Mader staging and the physical size of the bone defect after radical debridement [3]:

- Bone Defect $\leq$ 5 cm:** Papineau open bone-grafting technique (achieved 100% remission rate in our series) [5, 8].
- Bone Defect 3 to 8 cm:** Masquelet induced membrane technique in two stages (achieved 100% consolidation) [8, 10].
- Bone Defect $>$ 8 cm:** Ilizarov circular frame transport (achieved 99% consolidation and length/axis correction) [8].
- Intramedullary Infection:** Reaming followed by antibiotic-loaded cement nail [10].

Antimicrobial Recommendations & Biofilm Management

Empiric IV Protocol: Vancomycin (30-40 mg/kg/day) + Piperacillin-Tazobactam (200 mg/kg/day) post-operatively [11]. **Relais Oral (MSSA):** Dual combination therapy of Fluoroquinolones (Ofloxacin/Ciprofloxacin) + Rifampicin active against bacterial biofilms for at least 6 weeks to 3 months [11].

A Rare Complication: Marjolin's Ulcer

Chronic osteomyelitis neglected over decades carries a serious risk of malignant transformation into Marjolin's ulcer (squamous cell carcinoma) [6]. A 59-year-old diabetic and active smoker, with a history of recurrent multi-focal COM since childhood, presented following minor trauma. Deep tissue biopsy confirmed well-differentiated, keratinizing squamous cell carcinoma. A salvage mid-thigh amputation achieved durable oncological remission at 3 years of follow-up [6, 7].

7. CITED LITERATURE

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