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ORIGINAL ARTICLE

Early surgical site infection in adult appendicular skeleton trauma surgery: A multicenter prospective series[☆]

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Accepted: 8 June 2012

KEYWORDS

Surgical site infection;
Wound healing complication;
Surgical adverse events;
Infection control;
Nosocomial infections

Summary

Introduction: Surgical site infections (SSI) studies rely on an imprecise and debatable definition. The term “wound healing problems” (WHP), not necessarily septic, is also frequently cited. This study had the objectives of determining the frequency of early SSIs in traumatology, these terms eventual correlation, and the factors influencing onset.

Patients and methods: A multicenter prospective observational study was conducted in 12 centers. The exclusion criteria were open lesions as well as multiple injuries and multiple fractures (more than two fractures treated surgically). All patients were followed for the first three post-operative months until there was clinical certainty of healing and absence of infection. The presence of any WHP or SSI required a minimum follow-up of 1 year. WHP and SSI risk factors were determined using logistical regression adjusted on the centers.

[☆] This study was presented at the 86th SOFCOT meeting in Paris, November 2011.

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Results: Out of 1617 cases, 103 were complicated by a WHP and 22 by a SSI. The SSIs were mainly secondary to *Staphylococcus* infections. The factors predisposing the patients to WHP and SSI ($p \leq 0.05$) were age; the NNIS, ASA, and Parker scores; alcoholism; antiaggregant use; and the locoregional aspect at the time of injury. The 522 subcutaneous osteosyntheses "near the skin" resulted in 58 WHPs (11%) and 14 SSIs (2.7%); 13 of the 58 WHPs (22%) resulted in one SSI. Out of 707 deep osteosyntheses, 24 (3.4%) presented a WHP and seven (1%) a SSI; Four SSIs originated from a WHP. The 352 fractures of the trochanter were complicated by a WHP in 15 cases (5.5%) and a SSI in one case (0.4%) after interlocked nailing and two WHPs and two SSIs (2.5%) after screw and plate fixation. Of the 388 first-line arthroplasties, only the prostheses implanted for a proximal femur fracture presented complications: 21 WHPs (6%) and one SSI (0.02%). Of the 103 WHPs of the entire series, 18 became SSIs. In absence of WHP, the SSI rate was 0.2%, whereas the probability of a WHP evolving toward a SSI was 100 times higher. The only factor significantly associated with a WHP becoming a SSI was osteosynthesis material exposure.

Discussion: This prospective study can be criticized on several points: the deliberately limited inclusion criteria, the short follow-up, and the possible subjectivity of the data collection. The SSI rates reported are for the most part in agreement with the literature. This study is innovative in traumatology given the large number of patients and the notion of WHP that was preferred over superficial infection. It demonstrates the relations between WHP and SSI, in particular for osteosyntheses near the skin.

Level of evidence: Level III.

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Introduction

Surgical site infections (SSIs) are among the most dreaded complications, most often requiring surgical revision, altering the clinical and radiological result and calling into question the liability of the operator [1]. The definition of SSI remains imprecise and debatable, based on the presence of pus, the isolation of the bacterium, obvious clinical signs, and the surgeon's confirmation of this diagnosis [2]. The term "superficial infection" is often found in the literature with a definition that is just as contestable: bacterial colonization only involving the cutaneous and subcutaneous level and sparing the surgical site protected by the fascia. The term "scar tissue problem" (WHP), not necessarily septic, was proposed in the follow-up of arthroplasties and nothing stands in the way of applying it to traumatology [3]. WHPs can have variable clinical aspects: inflammatory contour, disunion, necrosis, or persistent discharge. The frequency of SSIs has most particularly been studied in elective arthroplastic surgery or globally without identifying the recent injury, and the relations between WHPs and SSIs have not been thoroughly explored despite the mandatory declaration of nosocomial infections in France [4–9].

This study had the objectives of determining the frequency of early SSIs in traumatology and their reciprocal relations, as well as establishing the predisposing factors; it is based on a clinical prospective series.

Material and methods

A multicenter prospective observational study² was conducted in 12 adult traumatology centers (Grenoble Sud

University Hospital, Lille University Hospital, Limoges University Hospital, Nancy University Hospital, Nancy Centre Émile-Gallé, Paris La Pitié University Hospital, Rennes University Hospital, Strasbourg Haute-pierre University Hospital, Toulon Hospital Center, Toulouse Purpan and Rangueil University Hospitals, Toulouse Nouvelle Clinique de l'Union) under the auspices of the French Orthopaedic and Traumatology Society (SOFOT) from 01/02 to 30/04/10². All open fractures, patients with multiple injuries or having stayed in the intensive care unit or with more than two fracture sites were excluded. The most representative fracture sites and surgical techniques were selected, creating three groups of lesions:

- osteosynthesis with superficial bone sites (called "near the skin"), located in the elbow, the patella, the ankle, and the tibial pilon;
- osteosynthesis on deep sites, for closed or open fractures of the femoral, tibial, humeral diaphysis and the diaphysis of the upper extremity of the humerus and femur;
- first-line arthroplasty of the hip and shoulder.

Based on a common observational data sheet, all patients were followed up for the first three postoperative months until there was clinical certainty of healing and absence of infection. Any WHP or SSI observed during this period led to a minimum follow-up lasting 1 year. Risk factors were sought based on logistic regressions adjusted on the centers. The relative risk associated with a variable X was measured using the odds ratio with 95% confidence intervals and significance was evaluated with a one-tailed test at the 5% level. Significance was set at $p \leq 0.05$ and a trend (or intermediate significance) was established when p was between 0.05 and 0.1.

² First presented at the 86th SOFOT meeting, Paris, November 2011.

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