**Procedure Basics and Technique Guidance**

STÉPHANE GUTH, XAVIER BUY, ALI GUERMAZI, and AFSHIN GANGI

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1.1

Introduction

Musculoskeletal interventional radiology procedures, in common with all interventional procedures, require some basic knowledge: prevention of infections, guidance techniques and needle manipulation techniques.

1.2

Prevention of Infection

The Centers for Disease Control and Prevention (CDC) and National Nosocomial Infections Surveillance (NNIS) system monitor reported trends in nosocomial infections in United States acute care hospitals. According to NNIS system reports, intervention site infections (ISI) are the third most frequently reported nosocomial infection, accounting for 14–16% of all nosocomial infections among hospitalized patients (unpublished data) (MANGRAM et al. 1999). In 1980, CRUSE and FOORD estimated that an ISI increased a patient’s hospital stay by approximately 10 days and cost an additional $2,000. A 1992 analysis showed that each ISI resulted in 7.3 additional postoperative hospital days, adding $3,152 in extra charges. Despite advances in infection control, ISIs remain a substantial cause of morbidity and mortality. Of course, all musculoskeletal procedures require strict adherence to standards of sterility. With bone procedures especially, a single mistake can lead to complications like osteitis or osteoarthritis. These are major complications of bone interventional procedures and they must absolutely be avoided. Strict adherence to the following asepsis rules is always mandatory.
### 1.3 Pathogenesis

Microbial contamination of the intervention site is the precursor of ISI. The risk of ISI can be summarized as ([Altemeier and Culbertson 1965; Cruse 1992]: Dose of bacterial contamination \times virulence / resistance of the host patient = risk of ISI.

Quantitatively, it has been shown that if an intervention site is contaminated with \( >10^5 \) microorganisms per gram of tissue, the risk of ISI is markedly increased ([Krizek and Robson 1975]). However, the dose of contaminating microorganisms required to produce infection may be much lower when foreign material is present at the site (i.e. 100 staphylococci per gram of tissue introduced on silk sutures) ([Elek and Conen 1957; James and MacLeod 1961]).

For most ISIs, the source of pathogens is the endogenous flora of the patient’s skin or mucous membranes. When mucous membranes or skin are incised, the exposed tissues are at risk for contamination.

Exogenous sources of ISI pathogens include surgical personnel, especially members of the operating team ([Calia et al. 1969; Letts and Doermer 1983]), the operating room environment (including air), as well as all tools, instruments and materials brought to the sterile field during the procedure.

Endogenous and exogenous flora pathogens responsible for infections in interventional bone procedure are the same as in orthopedic surgery:

- Staphylococcus aureus
- Coagulase-negative Staphylococci
- Gram-negative bacilli

### 1.4 Risk Prevention

#### 1.4.1 Patient Characteristics

Patient characteristics associated with an increased risk of an ISI include:

- Coincident remote site infections or colonization ([Bruun 1970; Edwards 1976; Valentine et al. 1986; Perl and Golub 1998; Mangram et al. 1999])
- Diabetes ([Gil-Egea et al. 1987; Mangram et al. 1999])
- Cigarette smoking ([Mangram et al. 1999])
- Systemic steroid use ([Gil-Egea et al. 1987; Mangram et al. 1999])
- Obesity (>20% ideal body weight) ([Mangram et al. 1999])
- Extremes of age ([Cruse and Foord 1973; Doig and Wilkinson 1976; Sharma and Sharma 1986; Mishriki et al. 1990; Mangram et al. 1999])
- Poor nutritional status ([Cruse and Foord 1973; Mangram et al. 1999])
- Perioperative transfusion of certain blood products ([Vamvakas and Carven 1998; Mangram et al. 1999])
- Preoperative nares colonization with Staphylococcus aureus
- Altered immune response
- Length of preoperative stay

The following recommendations are important in preventing ISIs:

- All infections remote from the surgical site must be identified before intervention
- The intervention must be postponed on patients with remote site infections until the infection has resolved
- Blood serum glucose levels must be controlled in all diabetic patients and perioperative hyperglycemia particularly must be avoided

#### 1.4.2 Operative Characteristics

##### 1.4.2.1 Preoperative Antiseptic Showering

A preoperative antiseptic shower or bath decreases skin microbial colony counts. In a study of 700 patients, chlorhexidine reduced bacterial colony counts nine-fold, while povidone-iodine or triclocarban-mediated soap reduced colony counts by 1.3- and 1.9-fold, respectively ([Garibaldi 1988]). Patients should be required to shower or bathe with an antiseptic agent at least the night before the operative day ([Mangram et al. 1999]).

##### 1.4.2.2 Preoperative Hair Removal

Preoperative shaving of the surgical site the night before an operation is associated with a significantly higher ISI risk than either the use of depilatory...