

## Indications for Antibiotics and Surgical Debridement for Low-Energy Intra-Articular Gunshot Injuries

*Mai Nguyen, MD<sup>1</sup>; Michael Reich, MD<sup>2</sup>; Jeffrey O'Donnell, BS<sup>1</sup>; Jonathan Savakus, BS<sup>1</sup>; Nicholas Prayson, BA<sup>1</sup>; Dominic Grimberg, BS<sup>1</sup>; Joseph Golob, Jr., MD<sup>1</sup>; Amy McDonald, MD<sup>1</sup>; John Como, MD, MPH<sup>1</sup>; Heather Vallier, MD<sup>3</sup>*

<sup>1</sup>*MetroHealth System, Cleveland, Ohio, USA;*

<sup>2</sup>*Case Western Reserve University, Cleveland, Ohio, USA;*

<sup>3</sup>*MetroHealth Medical Center, Cleveland, Ohio, USA*

**Purpose:** Intra-articular (IA) gunshot wounds (GSWs) pose a challenging treatment dilemma due to the contamination of the joint, possible presence of an IA foreign body, and associated osteochondral and soft-tissue injuries. Despite their commonality, no standardized treatment algorithm exists for antibiotic administration or surgical debridement. The purposes of this study were (1) to determine the incidence of infection after IA GSWs and (2) to develop a standard protocol for treatment of IA GSWs to minimize infection risk.

**Methods:** An IRB-approved retrospective review of a prospectively collected database at an urban, Level I trauma center was performed. The incidence of infections requiring intravenous antibiotics or surgical debridement, and other complications in a cohort of 99 adult patients with IA GSWs over 4 years was determined. Patient injury and demographic characteristics were noted. Initial antibiotics (type, route, and duration) and any surgical interventions were recorded.

**Results:** 86 patients (87.9%) with 89 IA GSWs were followed for a mean of 8 months. The other patients had insufficient records. Most injuries (71.9%) were of the hip or knee. There were 12 vascular injuries (13.5%), 9 of which required acute surgical intervention. All patients had their tetanus immunization status updated. Most (89.5%) received antibiotic prophylaxis, consisting most often of cefazolin (85.9%). Based on injury pattern and surgeon preference, patients were either treated nonoperatively (43.8%), with surgical debridement only (22.5%), with surgical debridement and fracture fixation and/or neurovascular repair (31.5%), or with percutaneous fracture fixation without debridement (2.25%). Two patients (2.25%) developed deep infection. Both of them had vascular injuries; one had a dysvascular limb and was treated eventually with amputation, while the other had observation of arterial spasm and underwent neurolysis due to neuropraxia of multiple nerves. Patients with vascular injury are at higher risk of infection compared to those without vascular injury (16.7% vs 0,  $P = 0.02$ ). Only 4 of the 39 injuries that were originally managed nonoperatively (10.2%) required elective surgeries: for extra-articular bullet removal (3 cases) and ulnar nerve allograft (1 case). None of the patients without surgical debridement of the injured joint developed infection.

**Conclusion:** The incidence of infection after IA GSWs is low, and IA GSWs do not appear to necessitate surgical debridement. No infections occurred after isolated IA GSW. Patients with vascular injury deserve special attention, as they are at higher risk of infection and other complications.