Nonpowder Firearms Cause Significant Pediatric Injuries

Michelle Veenstra MD, Heather Schaewe MSN RN, Lydia Donoghue MD, Scott Langenburg MD

Department of Pediatric Surgery
Children’s Hospital of Michigan
Detroit, MI
Disclosures

• Nothing to Disclose
Background

- Nonpowder firearms
  - BB guns
  - Pellet guns
  - Paintball guns

- Significant injuries to pediatric patients reported since the 1980s, with the most recent review in 2004
Background

• CDC Data from 2003-2013
  – 200,645 Injuries Nationwide
  – 127,742 Children (19 years of age and younger)

• Regulated by Consumer Product Safety Commission

• Not regulated as firearms nationally

• Regulation varies by state
  – Only 13 states have regulations for school grounds
  – Only 13 states have age restrictions
Michigan Law

- All high power and/or large caliber nonpowder firearms are treated as firearms
  - All restrictions on possession and purchase
  - Registration required
- Excludes BB smooth bore rifles or handguns, not exceeding 0.177 caliber
  - Age restriction of 18 years old on possession, use, and transfer when not in the presence of an adult
Background

- Injury Potential
  - 150 ft/sec can pierce the skin
  - 200 ft/sec fractures mature bone
- BB guns
  - 275-475 ft/sec
  - Potential injury to a distance of 60 ft (18 m)
- Pellet guns
  - 600-1250 ft/sec
- Paintball guns
  - 300 ft/sec
Methods

• Retrospective chart review of all pediatric nonpowder firearm injuries at Children’s Hospital of Michigan from 2003-2013

• Exclusion Criteria
  – Readmissions
  – Age 18 years old or greater

• Statistical Analysis using SPSS
  • Chi Square and ANOVA
  • p<0.05 significant
Objectives

• Primary Objective
  – Determine the incidence of pediatric nonpowder firearm injuries in Detroit

• Secondary Objectives
  – Review patients requiring operative intervention with nonpowder firearm injuries
  – Compare demographics in patients injured with nonpowder firearms to those injured by other types of firearms
# Patient Selection

## 330 Patients Presenting with Firearm Injury

- **17 Patients Excluded**
  - 14 Patients 18 Years of Age or Older
  - 2 Readmissions
  - 1 Gun Chamber Injury

## 303 Patients Reviewed

- 57 Nonpowder
- 246 Powder
Gun Characteristics

- **42 BB Gun**
  - 30 Head/Face Injuries, 5 Neck
  - 3 Abdomen, 2 Upper Extremity, 2 Lower Extremity

- **13 Pellet Gun**
  - 12 Head/Face Injuries
  - 1 Chest, 1 Neck & Leg

- **2 Paintball Gun**
  - 2 Eye Injuries
Demographics of Nonpowder Injuries

- **Gender**
  - Male: 48 (84%)
  - Female: 9 (16%)

- **Race**
  - African American: 26 (46%)
  - Caucasian: 21 (37%)
  - Hispanic: 4 (7%)
  - Multi/Other/Unknown: 6 (10.5%)
Comparison of Demographics

• Nonpowder Injuries
  – Less likely in females (p=0.04)
  – More likely Caucasian, fewer African American (p<0.01)

• No difference in age (p=0.36)
  – Nonpowder: 0-17 years, Mean 11 years
  – Other Firearms: 0-17 years, Mean 12 years
Intent of Injury

Nonpowder Firearm Injuries

- Self-Inflicted: 0%
- Violence: 32%
- Unintentional: 68%

Other Firearm Injuries

- Self-Inflicted: 2%
- Unintentional: 17%
- Violence: 81%

Children’s Hospital of Michigan
Shooter Identification

Nonpowder Firearm Injuries

- Stranger: 13%
- Self: 29%
- Friend, Family: 58%

Other Firearm Injuries

- Stranger: 71%
- Self: 11%
- Friend, Family: 18%
Nonpowder Firearm Injury Location

Most Common: Eye

Least Common: Chest

Eye 63%
Head 12%
Neck 10%
Chest 2%
Abdomen 5%
UE 3%
LE 5%

Children’s Hospital of Michigan
DMC DETROIT MEDICAL CENTER
Location of Injury

• Nonpowder Injuries
  – More head and neck injuries (p<0.01)
  – More eye injuries (p<0.01)

• Other Firearm Injuries
  – More injuries to chest, back, extremities, and abdomen (p<0.01)
  – More likely to have multiple injuries (p=0.01)
Radiographic Exposure

• Nonpowder Injuries
  – 39 patients with CT scan (68%)
  – Mostly orbit and head CTs

• Other Firearm Injuries
  – Fewer patients undergoing CT scan (36%)
  – Mostly head CTs
Significant Injuries

• Non-Operative Injuries:
  – Grade 3 splenic laceration, pulmonary contusion
  – Radial nerve injury

• Operative Interventions:
  – Multiple eye injuries (36 in total, 14 requiring OR)
  – 2 Patients for skull fracture and intracranial injuries
  – Common carotid artery repair
  – Bronchoscopy and laryngoscopy
  – Laparotomy and repair of 4 enterotomies
  – ORIF radius and fasciotomies
Operative Intervention for Nonpowder Firearm Injuries

- 25 Patients (44%)
  - 17 Patients within 24 hours of presentation
  - 8 Patients with delayed intervention
  - 3 Patients required multiple surgeries
- 100% of Paintball injuries (2)
- 45% BB gun injuries (19)
- 31% Pellet gun injuries (4)
Operative Intervention for Nonpowder Firearm Injuries

- No difference in patients undergoing operative intervention based on:
  - Age (p=0.59)
  - Gender (p=0.15)
  - Location of Injury (p=0.74)
  - Intent of Injury (p=0.6)
Disposition

- Length of Stay 0-8 Days
- All patients with nonpowder firearm injuries discharged home
- No mortalities

- Powder Firearm Injuries
  - Higher mortality
  - Some patients requiring rehabilitation facilities after discharge
Conclusions

• Despite Michigan laws to protect pediatric patients, injuries from nonpowder firearms continue to occur.
• Patients with nonpowder firearm injuries should be treated with the same index of suspicion for injury as other firearm injuries, particularly injuries to the head or neck.
• Nonpowder firearm injuries cause significant radiographic exposure and injuries that may require operative intervention.
Conclusions

• Nonpowder firearm injuries occur in a different demographic and environment than injuries from other firearms
• Overall, morbidity and mortality is less than powder firearms, but the potential for significant injury still exists
• Protective gear!
Thank You Questions?

Children’s Hospital of Michigan

DMC DETROIT MEDICAL CENTER