

Serious childhood injuries caused by air guns

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Objective: To determine the severity of nonfatal injuries to children caused by air guns and pellet guns.

Design: Case series (hospital chart review).

Setting: Inpatient wards of the Children's Hospital of Eastern Ontario.

Patients: All children under 18 years of age admitted to the hospital from Jan. 1, 1979, to Dec. 31, 1989, under ICD code E917, E922, E955, E965, E970 or E985 who had suffered air gun injuries.

Main outcome measures: Personal data, circumstances of event and clinical data.

Results: The 43 children (37 boys) had a median age of 12 years. The circumstances of the accident were known in 20 cases: 17 children were playing and 3 were cleaning the gun when it went off. Four children thought the gun was unloaded. In five cases the bullet ricocheted into the eye. Nine injuries were self-inflicted. Injury was to the extremities in 21 (49%), the eyes in 15 (35%) and the head and neck in 7 (16%). The median length of hospital stay was 4 days. Six children had long-term disabilities, all the result of eye injuries; two had cataract surgery, and four required enucleation of the eye.

Conclusions: Air guns can cause serious injury to children. Their sale needs to be banned or at least carefully regulated.

Objectif : Établir la gravité des blessures non mortelles infligées aux enfants par des armes à air comprimé et à plombs.

Conception : Série de cas (examen des dossiers d'hôpital).

Contexte : Salle de malades hospitalisés de l'Hôpital pour enfants de l'est de l'Ontario.

Patients : Tous les enfants de moins de 18 ans admis à l'hôpital entre le 1^{er} janvier 1979 et le 31 décembre 1989, sous les codes CIM E917, E922, E955, E965, E970 ou E985, qui avaient subi des blessures causées par des armes à air comprimé.

Principales mesures des résultats : Données personnelles, circonstances du cas et données cliniques.

Résultats : Les 43 enfants (37 garçons) avaient en moyenne 12 ans. Les circonstances de l'accident étaient connues dans 20 cas : 17 enfants jouaient et 3 nettoyaient l'arme lorsqu'elle s'est déclenchée. Quatre enfants croyaient que l'arme n'était pas chargée. Dans cinq cas, un oeil a été atteint à la suite d'un ricochet. Neuf blessures ont été causées par les victimes elles-mêmes. Les extrémités ont été affectés dans 21 cas (49 %), les yeux dans 15 cas (35 %) et la tête et le cou dans 7 cas (16 %). La durée moyenne du séjour à l'hôpital a été de 4 jours. Six enfants ont été victimes d'incapacité à long terme à la suite de blessures aux yeux; deux ont subi une intervention chirurgicale pour cataracte et quatre ont dû subir une énucléation.

Conclusions : Les armes à air comprimé peuvent causer de graves blessures aux enfants. Il faudrait en interdire la vente ou, du moins, la réglementer sévèrement.

Although frequently perceived as toys, air guns can cause severe injuries. Morgan, Turner and Pennell¹ described injuries to the abdomen in four boys, three of whom had wounds to one or more of the hollow viscera; serious thoracic injuries were reported by Nakamura and associates;² and Blocker, Coln and Chang³ described seven children who suffered potentially lethal air gun injuries — pneumothorax, perforation of the small

bowel, right parietal hematoma and cerebral contusion — from missiles discharged from multiple-pump air rifles. Eleven fatalities due to air gun injuries (primarily intracranial) have been reported in the English-language literature.⁴⁻¹³

Air guns can cause serious eye injuries. A 5-year nationwide survey in South Africa revealed that 87 children had suffered eye injuries caused by pellet guns;¹⁴ 77% had a final visual acuity of 6/60 or worse

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and 29% enucleation of an eye. In a review of penetrating ocular injuries (from all causes) repaired at the Wilmer Eye Institute, Johns Hopkins Hospital, Baltimore, Md., between 1970 and 1981 those associated with an intraocular BB pellet were found to carry the worst prognosis, regardless of the length or location of the laceration.¹⁵

We know of only one report of air gun injuries to Canadian children: of 12 boys with eye injuries from pellet guns 6 had a significant loss of vision and 1 enucleation of an eye.¹⁶

In this retrospective study we describe our experience with air gun injuries over 11 years at the Children's Hospital of Eastern Ontario, Ottawa, and suggest several measures to prevent such injuries.

Method

Air gun injuries are not classified under a specific E (injury) code in the *International Classification of Diseases* (ICD).¹⁷ In our hospital they are given one of the following ICD-E9 trauma codes: E917 (injuries caused by being struck accidentally by people or objects, whether moving, projected or stationary), E922 (accidents caused by firearm missiles), E955 (suicide and self-inflicted injuries by firearms and explosives), E965 (assault by firearms and explosives), E970 (injuries due to legal intervention with firearms) and E985 (injuries by firearms and explosives, whether suffered accidentally or purposely).

We reviewed the charts of all children under 18 years old who were discharged from the Children's Hospital of Eastern Ontario from January 1979 to December 1989 with these ICD-E9 codes. Children with air gun injuries were eligible for the study.

The following information was recorded for each case: personal data, including name, age, sex and address; circumstances of the event, whether an accident, assault, suicide attempt or self-inflicted injury, as well as the day and time of day; clinical data, such as the body part injured, length of hospital stay, number of recurrent visits to the hospital, number of radiographic examinations and details of long-term disability.

Data analysis was performed with the SPSS-X program (SPSS-X Inc., Chicago).

Results

From Jan. 1, 1979, to Dec. 31, 1989, 43 children (37 boys) were admitted because of air gun injuries. Of these, 34 (79%) were injured during the afternoon and evening hours; for 6 patients this information was missing. The median age was 12 years (limits 4 and 16 years); 38 (88%) were 9 to 16 years of age. Thirty children (70%) lived in rural areas.

Detailed information about the immediate circumstances of the injuries was not available in 23 (54%) cases. Of the other 20 children 17 were injured while playing (6 were target shooting) and 3 while cleaning the gun. In four instances the child thought the gun was unloaded. Five injuries resulted when pellets ricocheted and entered the eye. Nine injuries were self-inflicted.

Twenty-one (49%) patients suffered injuries to the extremities, 15 to the arms and 6 to the legs. The injuries were not serious, and usually only removal of the pellet and wound care were necessary. There was injury to the eyes of 15 (35%) children and to the head and neck of 7 (16%). In no case was more than one body part involved. The median length of hospital stay was 4 days (limits 1 and 21 days). Follow-up visits (median 1, limits 1 and 4) were required in 15 cases (35%). Three (7%) of the 43 children were readmitted, two for the removal of a cataract and one for the replacement of an eye implant. Thirty-five (81%) underwent radiographic examination (median number of radiographs 1, limits 1 and 3). Six children (14%) had long-term disabilities, all as a result of eye injuries: two had surgery for the removal of a cataract, and four required enucleation of the eye. Overall, 40% of the eye injuries led to long-term disabilities.

Discussion

Our study is limited because only the charts of children admitted to hospital were reviewed. Likely some children were treated for air gun injuries in rural emergency departments and sent home. Nevertheless, since our hospital is the major referral centre for 600 000 children the data probably accurately reflect the most significant injuries.

Although bicycles cause more injuries than air guns (unpublished data: Children's Hospital of Eastern Ontario, 1990), bicycles are important to children in ways that air guns are not: many children and adolescents rely on bicycles to get to school or other activities; furthermore, bicycles help keep young people fit. Even though some children undoubtedly enjoy using air guns these weapons should not be considered toys.

This study confirms that air gun injuries can have serious consequences. Although the proportion of severe injuries was low (14%), the long-term consequences were harsh. Four (9%) children underwent enucleation of an eye. The number of nonfatal injuries caused by air guns exceeded the number caused by rifles and handguns over the same period. From 1979 to 1989 only 10 children were admitted to our hospital because of rifle or handgun injuries. Four of them experienced long-term disabilities that were less serious than those caused by air guns

(unpublished data: Children's Hospital of Eastern Ontario, 1990).

The power of air guns confirms that they are not toys. The destructive power of any gun is directly correlated to the projectile's mass and velocity. The Canadian criminal law definition of firearms includes any barrelled weapon designed or adapted to discharge a shot, bullet or other missile at a muzzle velocity exceeding 152 m/s.¹⁸ Although air guns are commonly perceived as playthings and their cost is relatively low (\$30 to \$60) the multiple-pump air rifle can achieve a maximal muzzle velocity of 198 m/s.³ In comparison the .32 or .22 calibre pistol has a velocity of 244 m/s.¹⁹ The common BB gun produces muzzle velocities of 85 m/s. Although not within the range of the legal definition of firearms such velocities are well above the speed needed to penetrate the eye (39 m/s). Penetration of bone requires a pellet velocity of 106 m/s.^{10,20,21}

Recommendations

Legislation

Banning the sale of air guns may limit the number of air gun injuries to Canadian children.

Unlike powder firearms, which are subject to more control in Canada than in the United States, air gun use is not regulated in Canada. Paradoxically, 12 US states have recognized the dangers of air guns and have passed legislation limiting the sale and use of nonpowder firearms or requiring a permit for their possession.²² Since Canada has laws restricting the use of powder firearms it would be consistent to consider air guns as firearms rather than toys and enact similar legislation.

Application of Canadian firearm legislation to air guns would limit their purchase to people older than 16 years and would require knowledge of safe handling and operation. Two conditions that could be added to the legislation are the restriction of air gun use to supervised target ranges, to avoid the hazards of ricochets, and the mandatory use of protective goggles to reduce the risk of injury.

Mechanical changes

Although difficult to implement, the following mechanical changes could make air guns safer: decreased pellet velocity, a design to prevent easy discharge and some way of distinguishing a loaded from an unloaded air gun. Pellets made of magnetic material would be easier to remove.¹⁴

Education

Many adults are not aware of the risks when

purchasing air guns for the young. More publicity is required in the media and in schools and doctors' offices.

Research

Retrospective studies such as ours are limited in the amount of detailed information that can be obtained. Prospective studies are needed to investigate various aspects of air gun injuries; for example, air gun ownership, purposes of purchase, and knowledge of gun care and safe use. Separate E codes for air gun injuries would improve access to the medical records.

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