

CLINICAL NOTE

Injuries from pepper spray used for self-defence: analysis of 15 cases managed in an emergency chemical decontamination area

Montserrat Amigó^{1,2}, Fuensanta Fernández¹, Verónica Velasco³, Santiago Nogué^{2,4}

We analyzed epidemiologic and clinical characteristics, treatment received, and clinical course in cases of pepper spray injury treated in the chemical decontamination area of an emergency department over a 5-year period. A total of 15 patients with a mean (SD) age of 25 (8.3) years were included. Thirteen were men and 53% were foreign-born. All uses of pepper spray occurred during muggings that took place mainly in the early hours of the morning (66.7% between 4:30 and 6:30 AM). Two or more attackers were injured in 60% of the events. Seventy-three percent of the attacks took place on the street and the median delay in reaching the emergency department was 30 minutes. The face and eyes were usually injured, and symptoms included itching, irritation, burning, and pain. On arrival, the patients were treated immediately (mean delay, 3 minutes) with hypertonic saline, an amphoteric surfactant, and a chelating agent in 80% of the cases, in which improvement was substantial as mean pain scale scores changed from 7.2 on admission to 3 on discharge ($P=0.009$). Patients spent an average of 40 minutes in the treatment area. Eleven patients required further care from an ophthalmologist and topical medication for symptoms. Outcomes were good and there were no complications in any of the cases. We conclude that pepper sprays are being used as an aid to self defense in muggings in our community. Decontamination measures have priority as they alleviate symptoms and prevent long-lasting effects.

Keywords: Capsicum spray. Chemical decontamination. Triage, advanced. Nursing.

Agresiones realizadas con espráis de defensa personal atendidas en el área de descontaminación química de urgencias. A propósito de 15 casos

Evalúan las características epidemiológicas, clínicas, terapéuticas y evolutivas, de las asistencias realizadas en el área de descontaminación química (ADQ) del servicio de urgencias, a consecuencia de un ataque con espráis de defensa personal durante un período de 5 años. Se han incluido 15 pacientes con una edad media de 25 años. Trece fueron hombres y el 53% eran personas no nacidas en España. En todos los casos la agresión con el spray se produjo en el curso de una pelea o con ánimo de robo, sobre todo de madrugada (66,7% de los casos entre las 4:30 y las 6:30 h). En el 60% de las atenciones hubo dos o más personas afectadas de forma simultánea. El ataque se produjo en la vía pública en el 73% de las ocasiones y tardaron una mediana de 30 min en llegar a urgencias. Cara y ojos fueron las zonas más afectadas y los síntomas referidos con mayor frecuencia fueron el picor, irritación, quemazón o dolor. El tratamiento aplicado en el hospital fue inmediato (media de demora: 3 min) y se empleó una solución hipertónica, anfótera y quelante en el 80% de los casos, con notable mejoría sintomática, pasando en la escala visual analógica (EVA) del dolor de una puntuación media de 7,2 al ingreso a 3 a la salida ($p = 0,009$). El tiempo medio de permanencia en el ADQ fue de 40 min. Once de los casos precisaron además asistencia oftalmológica y tratamiento tópico sintomático. La evolución fue favorable y sin secuelas en todos los casos. Concluimos que el uso de espráis de defensa personal con ánimo de robo o agresión es una realidad en nuestro medio. Las medidas de descontaminación son prioritarias y contribuyen a aliviar los síntomas y evitar secuelas.

Palabras clave: Espráis de defensa personal. Descontaminación química. Triage avanzado de enfermería.

Introduction

Tear gas has traditionally been used as a chemical weapon and is now used regularly by security forces as part of its riot gear to disperse unauthorized protesters and demonstrators with inappropriate behaviour. But in Spain and other countries, an adult person can also use them legally in armoury, in the form of a spray for individual use and personal defence. Purchase is subject to the regulation of arms (Royal Decree 137/1993) but now they can also be acquired through Internet easily

and cheaply (from 15€). Although sold as an object of defence, they can be used offensively and, depending on the circumstances in which this action occurs, could have criminal consequences.

These agents, popularly known as pepper spray, have a variable chemical composition but always include some irritant compound for the conjunctival mucosa, which induces severe eye irritation, lacrimation and unstoppable blepharospasm that incapacitates the individual and causes him/her to seek immediate help¹. The objective of this study was to evaluate the emergency

Author affiliation:

¹Área de Urgencias, Hospital Clínic, Barcelona, Spain.

²Grupo de investigación: Urgencias: Procesos y Patologías. IDIBAPS, Barcelona, Spain.

³Facultad de Química, Universidad de Barcelona, Spain.

⁴Sección de Toxicología Clínica. Hospital Clínic, Barcelona, Spain.

Contribution of authors:

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Corresponding author:

Santiago Nogué
Sección de Toxicología Clínica
Área de Urgencias. Hospital Clínic
C/ Villarroel, 170
08036 Barcelona, Spain.

Email:

SNOGUE@clinic.ub.es

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department (ED) attention of people attacked by pepper spray in personal defence situations.

Clinical cases

We performed a prospective, descriptive study of all such cases attended in the Area of Chemical Decontamination (ACD) of the Hospital Clínic de Barcelona. The 5-year period analysed was from 2010 to 2014). In the ACD, we used a normal work procedure (NWP) for skin and ocular decontamination designed by the Clinical Toxicology Unit and agreed with the heads of the ED and the Nursing staff. This NWP contemplates that the triage nurse detects the need for decontamination after recent contact with chemical products, transfers the patient immediately to the adjacent ACD and initiates a protocolized decontamination process without waiting for an express medical order, because it is included in the Cited NWP, thus establishing advanced triage of cutaneous and ocular decontamination. The patient is then seen by the appropriate specialist to complete evaluation and treatment.

Data were collected from the ED admissions record (admission and triage) and a series of variables were collected, including epidemiological data (sex, age, country of origin), circumstance (location of the incident, time, reason for the aggression, responsible agent), clinical symptoms (including pain according to visual analogue scale (VAS) before and after eye-wash) and treatment administered (type of decontamination, topical cure). Follow-up was performed by telephone contact and/or medical history. All variables were entered into a SPSS database version 15.0 for statistical analysis. The results were expressed as absolute values, percentages, means or medians. Regarding the pain scale, a comparison of the mean score before and after decontamination was made using the Student's t-test for paired samples. The study was approved by the Research Ethics Committee of Hospital Clínic de Barcelona.

Fifteen patients were attacked with personal defence sprays, representing 13.4% of all (112 people) skin and ocular decontaminations performed in the ACD. The main characteristics of this series are presented in Table 1. Median age of those affected was 25 (15) years; 27 (15) years in the thirteen men and 21 (1) years in the two women. The majority (53%) of patients were not born in Spain, predominantly of South American origin (33%). In all cases, there had been aggression during a fight or with the intention of stealing personal belongings or articles from a small commercial establishment, especially at dawn (66.7% of cases between 4:30 and 6:30 h) and in 60% of the cases there were two or more victims sprayed simultaneously. The attack occurred in public places in 73% and 20% in a discotheque. Median delay in reaching the ED was 30 minutes. The eyes (100%) and face (73.3%) were the most affected areas and the predominant symptoms were itching, irritation, burning or pain.

The treatment applied in the ED was almost immediate (mean delay: 3 min) and water (13%), saline solution (7%) or a hypertonic, amphoteric and chelating solution (Diphoterine®) were used in 80% of the cases. The use of this latter solution was associated with symptomatic improvement in 6 of the 9 cases where it was applied, with a descent in VAS pain score from a median of 7.2 (2.4) beforehand to 3.0 (1.8) points after decontamination ($p = 0.009$). Mean time to stay in the ACD was 40 min in 80% of the cases. Eleven (74%) cases also required a topical cure by the ophthalmologist. All cases evolved favourably and no sequelae were recorded.

Discussion

Personal defence sprays, like so-called tear gas, contain various chemical agents such as chloroacetophenone (CN agent), (2-chlorobenzylidene) malonitrile (CS agent)² or capsaicin, the latter known as pepper spray³. In addition, a solvent and a propellant gas is needed to project the particles and generate smoke or aerosol⁴. Although conceived for defensive use, these sprays can also be used offensively to assault others in the context of a fight or to perpetrate a robbery by taking advantage of the victim's helplessness.

These agents produce rapid irritation of the mucous membranes which results in ocular burning, tearing, photophobia and blepharospasm that impedes vision⁶. If the spray is operated too close to the face and eyes, maxillofacial and corneal lesions can occur⁷ and if the exposure is intense and/or prolonged, it may affect the nasal mucosa (rhinorrhea), throat (dry cough) and respiratory tract (laryngeal obstruction, bronchospasm)⁸ with nausea. Long-term sequelae for the respiratory system have been described⁹ as have some fatal cases usually associated with exposure in closed spaces in people with a previous respiratory pathology^{10,11}.

Treatment involves the removal of the source of exposure and the removal of contact lenses if any. From there, decontamination options range from copious irrigation with water or saline solution 0.9% for 10-15 min in ocular contaminations¹² to water and soap in skin contaminations (especially for liposoluble agents or those that adhere to the skin), thorough decontamination with hypertonic, amphoteric and chelating solutions^{13,14} and to special substances (antidotes) for very specific toxic substances¹⁵. In most of the cases presented here, application of amphoteric and chelating solution was significantly associated with a rapid improvement of symptoms, but the time factor (the shorter the better) is probably more important than the type of decontaminant. If symptoms persist, an ophthalmological consultation is always needed. Important skin lesions may require topical corticosteroids and antihistamines, as well as consultation with a dermatologist or surgeon. Other symptoms (respiratory, digestive) are treated symptomatically.

Patients' clothing may contain tear gas remnants, so

Table 1. Characteristics of patients attacked with personal defence sprays¹

Sex	Age	Place of incident	Affected area	Symptoms	Previous Treatment	CDA Treatment	VAS prior	VAS after	Destination	Additional treatment	Sequelae	Judicial Part
Male	72	Public Space	Ocular	Pain	Unknown	Water	NR	NR	Ophthalmology	Yes	No	Yes
Male	25	NR	Ocular	Irritation and redness	Unknown	Diphoterine®	NR	NR	Ophthalmology	Yes	NR	No
Male	34	Public Space	Ocular	NR	None	Water	NR	NR	Ophthalmology	No	NR	Yes
Male	41	Shop	Ocular and cutaneous	NR	Water	Water (skin) + saline serum 0.9% (eyes)	10	8	Ophthalmology	Yes	NR	No
Male	19	Shop	Ocular and cutaneous	NR	Milk	Diphoterine® and Afterwash®	7	2	Surgery	No	NR	Yes
Male	45	Public Space	Ocular and cutaneous	NR	Milk	Diphoterine® + Afterwash®	7	2	Surgery	No	No	Yes
Female	20	Public Space	Ocular and cutaneous	NR	Milk	Diphoterine® + Afterwash®	NR	NR	Surgery	No	NR	Yes
Male	19	Public Space	Ocular and cutaneous	NR	Milk	Diphoterine® + Afterwash®	NR	NR	Surgery	No	NR	Yes
Male	20	Public Space	Ocular and cutaneous	Itching and irritation	None	Diphoterine®	7	4	Ophthalmology	Yes	No	No
Male	20	Public Space	Ocular and cutaneous	Itching	None	Water + Diphoterine® Afterwash®	10	2	Ophthalmology	Yes	No	Yes
Male	19	Public Space	Ocular and cutaneous	Pain, itching and burning	None	Water + Diphoterine® + Afterwash®	10	3	Ophthalmology	Yes	No	Yes
Male	34	Public Space	Ocular	Pain and burning	Water	Agua + Diphoterine® + Afterwash®	10	0	Ophthalmology	Yes	No	Yes
Male	40	Disco	Ocular and cutaneous	Pain, itching and burning	None	Diphoterine® + Afterwash®	5	5	Ophthalmology	No	No	Yes
Female	22	Disco	Ocular and cutaneous	Pain, itching and burning	None	Diphoterine® + Afterwash®	3	3	Ophthalmology	No	No	Yes
Male	27	Disco	Ocular and cutaneous	Pain, itching and burning	None	Diphoterine® + Afterwash®	6	6	Ophthalmology	No	No	Yes

NP: Not precise; ACD: Area Chemical Decontamination; VAS: pain according to visual analogue scale (0-10). Diphoterine®: Hypertonic, amphoretic and chelating solution. Afterwash®: Isotonic solution.

they should be treated as a chemical-contaminated material and stored in specific containers. In some cases, there is a risk of transferring the product to other people, including health personnel, so self-protection measures are necessary when performing decontamination of the patient to avoid self-contamination¹⁶.

The experience presented here supports the existence of an ACD in the ED^{17,18}. These spaces, adjacent to the ED entrance, should be equipped with decontaminating material and self-protection for the health personnel, who in turn must be instructed to decontaminate quickly, effectively and safely, a role usually assigned to nursing staff. In this sense, advanced triage, as in other urgent toxicological situations, is fundamental¹⁹⁻²³.

In short, this study shows that personal defence sprays are available in our environment and are used offensively. Immediate decontamination relieves symptoms and, if they persist, ophthalmologic consultation is necessary.

Conflicting interests

The authors declare no conflict of interest related to this article.

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Ethical Responsibilities

The Ethics and Clinical Research Committee of Hospital Clínic in Barcelona approved the study.

Informed consent was obtained from participants.

All authors have confirmed the maintenance of confidentiality and respect for patients' rights in the author's responsibilities document, publication agreement and assignment of rights to EMERGENCIAS.

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