



Original communication

Deaths resulting from the use of firearms by police against motor vehicles: Study of cases in Porto, Portugal

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ABSTRACT

The objective of this study was to investigate the terminal ballistics of police shootings in which the bullets went through any motor vehicle structure before fatally wounding the occupants. 6 cases that occurred in Porto district between 1998 and 2013 were studied. The firearms used were 7.65 mm ($n = 1$) or 9 mm ($n = 3$) calibre semi-automatic pistols and 9 mm calibre submachine guns ($n = 2$); the bullets were full metal jacket type. The metal jacket of the collected projectiles was totally or partially destroyed in 3 cases. It exhibited a deformed structure in all cases. The trajectories of the bullets in the vehicles were always more or less linear, even when initial impact was at an oblique angle. The entry holes in the victims' bodies were larger or much larger in size than the calibre of the bullets. They were located, with the exception of one of the cases, in the left half of the body. The trajectories in the victims' bodies were from front to back, in one case, and from back to front in all others. Exit wounds were only found in two cases. Death occurred immediately after the victim was shot only in one case, despite a vital structure has been hit in all cases. The cases studied support the idea that the use of firearms against vehicles with the sole intention of immobilisation entails uncontrollable danger to the lives of the occupants, and especially when done by police forces not specifically trained for that purpose. Therefore, such use of firearms should be avoided.

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1. Introduction

The shooting of firearms against motor vehicles, in particular against the tyres, continues to be used by police officers as a means of immobilising motor vehicles in which citizens are fleeing.^{1–5} The use of firearms in this way, besides having reduced effectiveness in the immobilization of vehicles, is also quite inaccurate⁵ because the shots are usually made when the motor vehicles are mobile, and when bullets strike the structure of a motor vehicle they may suffer deformation, fragmentation⁶ and unpredictable trajectory changes.^{7,8}

The lack of accuracy when shooting against motor vehicles means that the occupants may sometimes be hit, fatally in some cases,⁴ often in situations where it would only be permissible to shoot to immobilize the vehicles.^{3,5} The high probability of such occurrences has led to recommendations⁹ or even the banning⁵ of the use of firearms against vehicles when the occupants are not acting in a manner that endangers the life or essential physical integrity of police officers or third parties.

When bullets strike motor vehicle structures, their behaviour will be influenced by a number of factors including their velocity, energy and construction (mass, shape and material properties), as well as the angle of incidence¹⁰ and material they pass through (metal or glass). The terminal wound ballistics performance in the body of the occupants of the vehicles will essentially depend on the bullet's characteristics,^{11,12,8} the effects arising from the interaction with the vehicle's structure,⁸ the occurrence of fragmentation and/or deformation of the bullets,¹¹ the amount of kinetic energy and

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momentum¹² with which the bullets strike human tissue,^{11,13} the nature of the affected tissues^{14,15} and the anatomical area and anatomical structures that are impacted.¹⁵

The most common bullet associated with police shootings is the 9 mm Luger full metal jacket (FMJ) round nose. This bullet shows the smallest deformation¹⁶ regardless the separation of the core and the jacket and even the fragmentation.⁷ At the same time, this bullet presents a considerable capacity of perforation of metal plate and glass, not only at 90° but also at lesser angles.⁷ The remaining velocity of this bullet after perforate this kind of intermediate targets is high, in some cases 95% of the maximum.⁷ Because of this remaining velocity, in case of shooting against motor vehicles, it may occur collateral damages, namely when shooting against glasses.⁸ The expandable bullets have been studied as an alternative to the FMJ bullets.^{17,8} However, this alternative is not yet consolidated because, in cases of shooting against a glass window, the expandable bullets still not being effective against an hostile target and not accurate, in particular for shooting lesser than 90°.⁸

The study of the fatal injuries to the occupants of vehicles that police officers shoot at is deemed relevant to the forensic sciences, in particular, not only for the intrinsic seriousness of such injuries but also due to the shortage of studies that use actual cases in a holistic perspective of the vehicles and the occupants. Such a study may contribute to the discovery of the truth in similar cases where the conduct of the police officers involved is being investigated.

The objective of this study was to investigate the terminal ballistics of fatal police shootings in which the bullets hit the motor vehicle structure before wounding the occupants.

2. Materials and methods

A list was requested from the Procuradoria-Geral da República and the Inspeção-Geral da Administração Interna of the criminal proceedings against police officers accused of having caused the death of citizens as a result of discharging their firearms while on duty in Porto district. Between 1998 and 2013, 11 criminal cases involving police officers were identified in the courts. Seven of those cases involved the victims being shot while inside their motor vehicles.

A specific authorisation was also requested from the magistrates in charge of the cases to view the case documents and to digitally reproduce the images of the injuries and the damage to the motor vehicle resulting from the shooting. The study found one case in which the victim was struck at very close range and not through the vehicles structure. As a result, this case was excluded from the study. Thus, the current study will focus on 6 criminal cases.

Information based on the police and court registries and also on the forensic pathology provided by the Instituto Nacional de Medicina Legal e Ciências Forenses, Instituto Público (INMLCF, I.P.) was gathered. A guide was designed for data extraction and the three main topics were addressed: (1) police shooting characteristics (year, time of occurrence, type of incident, position of the victim in the vehicle, position of the victim relative to the officer, type of firearm, make of firearm, calibre of firearm, type of bullet, make of ammunition; calibre of bullet; circumstances surrounding bullet strike to the motor vehicle in terms of its movement; direction of movement of the officer at moment shot fired; judicial decision); (2) forensic ballistics data regarding the vehicle (distance of the shots, no. of shots, initial impact area, angle of incidence, direction of shot(s) that hit the victim, exit area of bullet(s), loss of bullet jacket(s), deformation of bullet(s), significant loss of bullet(s) mass); (3) data related to the forensic medical autopsy (number of bullets that struck the victim; anatomical region of entry wound(s); shape of entry wound(s), dimension(s) of entry wound(s), anatomical region of exit wound(s), shape of exit wound(s),

dimension(s) of exit wound, path of the bullet/s through the victim's body, need for medical assistance/hospitalisation, survival time).

Photographs were also collected from forensic ballistics and forensic pathology reports of each of the cases, illustrating the effects of bullets on the structure of motor vehicles and the injuries caused by the bullets in the victims' bodies.

Each case will be specifically described and then a summary of main results will be provided.

3. Results

3.1. Police shooting characteristics

Table 1 provides a general description of the shots fired. The fact that a submachine gun was only used in cases 2 and 3 is highlighted. In case 1 the calibre of the weapon used was not 9 mm but 7.65 mm. All the bullets fired were of full metal jacket type (FMJ).

The shots were fired at a time when the motor vehicles struck were mobile, except for case 4, where the vehicle was stopped. The police officer fired from a moving police car only in case 3. In the other cases, the police officers fired when they were outside of the police car and in a stationary position.

It was proven at each trial that the intention of the police officers who carried out the shootings was never to hit the occupants but immobilise the vehicles and arrest the fugitives. The death of the victims was, therefore, considered an accidental event in all cases by the courts. Except for case 6, the police officers allegedly tried to aim at the tyres of the motor vehicles, but never managed to hit them. The police officers were acquitted in case 1 and 6, and convicted of homicide and sentenced in the other cases.

3.2. Forensic ballistics and pathology findings: case description

The bullets that struck the victims were all deformed but had no significant loss of mass. Fig. 1 provides an example related to case 1. With the exception of cases 1 and 6, the bullets metal jacket had totally or partially separated from its internal core. The bullets ended their travel in the body of the victims (number of bullets = 5) or inside the vehicle (number of bullets = 3).

Table 2 and Table 3 summarise other data contained in the forensic ballistics and forensic pathology reports. The relevant specificities of each case are presented in detail below.

3.2.1. Case 1

The bullet was fired through the window of the left front driver's door of the vehicle and struck the driver in the posterior of the left hemithorax (Fig. 2), passing through the eighth intercostal space on the left side and fracturing the upper edge of the ninth rib. The bullet then travelled in the chest cavity to the left diaphragmatic angle and entered the left lung. It then continued to the abdomen, where it injured the stomach, intestines, and upper and lower zones of the right lobe of the liver. It was not possible to obtain information about the anatomical region in which the bullet was found. The victim underwent numerous surgeries in a hospital environment, before dying 8 h after being shot.

3.2.2. Case 2

The police officer fired 6 rounds in the direction of the back of a light commercial motor vehicle. Two of the bullets with a horizontal trajectory from back to front, perforated the left rear door of the motor vehicle and crossed the metallic cargo compartment (Fig. 3) and the driver's seat in a rectilinear path, striking the victim in the right half of the lumbar region (Fig. 4). In the spine, the bullets fractured the plate, pedicle and transverse apophysis of

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