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CASE STUDY: MICROBALLISTIC CONFRONTATION EXAMINATION USING AN AIR GUN ADAPTED FOR USE AS A FIREARM

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CONTEXTUALIZATION

Firearms are one of the main instruments used in homicides in Brazil. According to the latest Brazilian Public Security Yearbook, released in 2021, 42,105 intentional homicides were recorded across the country, with 75.8% of cases of intentional violent death caused by firearms [1].

Associated with the large number of incidents that use firearms as an instrument, the large number of firearms seized in 2020 stands out, totaling 109,137 weapons, as well as the increase in the number of active firearms registrations in the country. SINARM and SIGMA totaling 2,077,126 [1]. Since 2017, around 11 Brazilian states have increased the number of active registrations by more than 100%.

Still looking at the scenario of the use of firearms, it is important to highlight that, in 2020, 1,350 cases of femicide were recorded in Brazil, of which around 26.1% were perpetrated by firearms [1].

Within the profile of weapons seized in Brazil, we find, in addition to industrially manufactured firearms, such as revolvers, pistols, garruchas, rifles, shotguns, semi-artisan weapons are also seized. In these cases, the ballistic artifact is created by hand and can be produced by fully manufacturing all the parts or by using parts from other weapons, whether firearms or not. It is common to use objects that, in principle, would not be components of firearms, but that have been adapted to function as such [2]. In general, the mechanism is quite simplified, the which also significantly compromises your security.

In some cases, industrial weapons are modified to make them more efficient, such as the possibility of using more powerful calibers [2]. For example, in adapted air weapons, the user makes changes to the original mechanism that, primarily, uses pellets as ammunition, so that these adaptations allow the weapon to be able to function, in practice, as a firearm. The most common modifications are the exchange of the pressure system for a spring percussion mechanism compatible with the caliber of ammunition that is intended to be used in that device, as well as the enlargement of the rear region of the barrel, so that it is compatible to accommodate the ammunition. actual to be used.

PROBLEM

The important participation of firearms as an instrument used to perpetrate homicide reinforces the importance of the participation of criminal expertise as an indispensable resource in providing material evidence related to these artifacts. Forensic Ballistics is essential for the correct identification of firearms, as well as carrying out all examinations that attest to their efficiency and, more specifically, carrying out a ballistic micro-comparison examination that allows the correlation of questioned/incriminated material with material pattern of the firearm under analysis.

The expert ballistic micro-comparison or Microballistic Confrontation examination allows an element of ammunition related to a crime (projectile or case) to be compared to the standard element of a firearm suspicion, through convergent microscopic characteristics, mainly the microstriations recorded on the surface of the projectile during its passage through the rifled barrel of a firearm or the characteristics and microstriations caused by the percussion of the case's fuze [3].

This work aims to present a case study with the results of a Microballistic Confrontation exam in a case of feminicide caused by a firearm, in which the suspected weapon was

an air rifle with an adaptation of its percussion mechanism, for peripheral percussion of cartridges of nominal caliber.22 LR and similar.

DEVELOPMENT

On August 15, 2021, the Military Police of the city of Novo Gama/GO received information that a couple had fought in a region of farms and that the husband had shot his wife with a firearm. After confirmation of the woman's death by the Military Fire Department, the Crime Scene Expertise team from the 14th Regional Coordination of Technical-Scientific Police of Goiás, based in Luziânia/GO, was called to carry out an expert examination at the scene of the crime. violent death. The responsible criminal expert collected and sent two caliber.22 LR casings to the Ballistics Section, requesting that a Microballistic Confrontation test be carried out between the material collected and the firearms seized by the Police Station at the scene of the crime.

The responsible Police Station sent two firearms, one of which was a firearm, similar to an air rifle, with characteristics of having gone through an adaptation process to change its function from an air weapon to a firearm (Weapon A – Fig. 1). An air gun was also sent, with a nominal caliber of 4.5mm, compatible with pellets of the same caliber, without changes to its mechanism. In addition, four more cases of nominal caliber.22 LR were sent

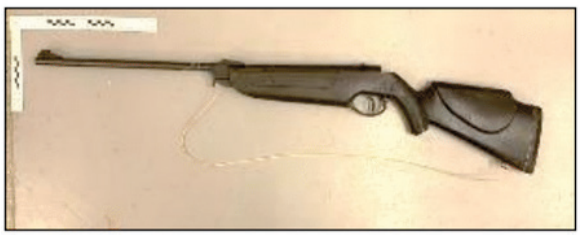

Figure 1: Air rifle, adapted for nominal caliber.22 LR, sent by the Police Station (Weapon A)

During the expert examination of the Microballistic Confrontation, which also includes expert examinations of the characterization and efficiency of the weapon analyzed, it was found that Weapon A was, originally, a Rossi brand pressure rifle, Dione model, of nominal caliber 5.5mm and which worked through the pressure generated by the displacement of a spring-loaded plunger, which went through an adaptation process so that it was capable of wedging and striking ammunition of nominal caliber.22 LR and similar. Weapon A was originally a rifled weapon, featuring 12 full and 12 hollow with right-handed orientation, compatible with 5.5mm caliber pellets. After the adaptations, Weapon A started to fit cartridges of nominal caliber.22 LR by enlarging the rear region of the barrel and had an adapted firing pin and peripheral percussion system (Fig. 2), and, after the modifications, the weapon did not it was more capable of firing shots using pellets as ammunition.

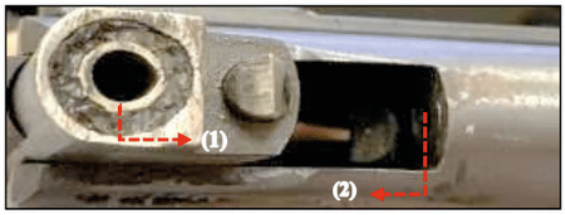

Figure 2:(1) Adaptation of the pipe; (2) Adaptation of Weapon A's percussion mechanism

During the autopsy of the victim's body on August 16, 2021, the medical examiner responsible for the examination collected a projectile from the right chest cavity and sent it to the Ballistics Section. This material was also examined in order to compose the Microballistic Confrontation examination with the firearm sent by the Police Station, being a projectile, lead warhead, nominal caliber.22 LR

Therefore, the Microballistic Confrontation examination was carried out between two cases of nominal caliber.22 LR collected at the scene of the victim's death (EI1 and EI2 – Fig. 3), four nominal caliber.22 LR cases (EI3, EI4, EI5 and EI6 – Fig. 4) sent by the Police Station, a nominal caliber projectile.22 LR (PI1 – Fig. 5) removed from the victim's body and the standard projectiles and cases collected from the compatible firearm Weapon A: the air rifle adapted to the nominal caliber.22 LR

Figure 3: Cases of nominal caliber.22 LR collected at the scene of the crime

Figure 4: Cases of nominal caliber.22 LR sent by the Police Station responsible for the case

Figure 5: Projectile removed from victim's chest cavity

After adequate hygiene of the ammunition elements sent for examination (incriminated elements) and the collection of standard elements of the firearm sent (Weapon A), a comparative examination was carried out using a Leica® Optical Comparator Microscope and a Comparator Microscope Evofinder® electronic. In this examination, the striations of the projectiles were carefully observed in search of the identification of characteristic elements converging in the ray between the projectile removed from the victim's body (PI1) and the standard projectiles from Weapon A. In the comparative examination of the cases, we sought analyze the percussion marks and microstriations formed by the impact of the case's butt against the breech, which can be recognized as repeated and coinciding when compared.

The Microballistic Confrontation exam carried out resulted in a positive comparison between the projectile removed from the victim's body and the standard projectiles from Weapon A (Fig. 6), as well as a positive result between the incriminated cases EI1, EI2, EI3 and EI4 and the standard cases of Weapon A (Fig. 7), in addition to an inconclusive result between the incriminated cases EI5 and EI6.

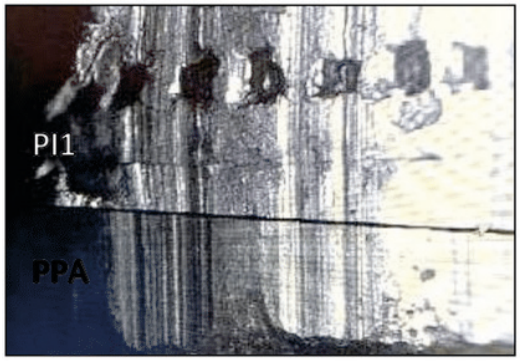

Figure 6: Exemplary photomicrograph of some of the coincidences found between the incriminated projectile PI1 and the standard projectiles from Weapon A. In the image: incriminated projectile PI1 x standard PPA projectile.

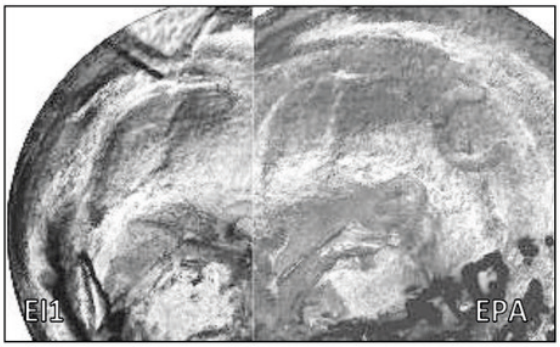

Figure 7: Exemplary photomicrograph of some of the coincidences found between the incriminated cases EI1 to EI4 and the standard cases of Weapon A. In the image: incriminated case EI1 x EPA standard case

Thus, it was concluded through comparative examination that the projectile removed from the victim's chest cavity had been expelled through the rifled barrel of the firearm, similar to an air rifle, adapted to the nominal caliber.22 LR (Weapon A), as well as the cases EI1 and EI2, collected at the scene of the crime, and EI3 and EI4, sent by the Police Station, had been struck by that same firearm.

The EI5 and EI6 cases did not differ, butNo significant similarities were found either, so it was not possible to conclude whether they were struck by Weapon A.

CONCLUSION

Thus, after carrying out a comparative Microballistic Confrontation examination, it was possible to obtain a strong and safe answer about the weapon that caused the shot, through indirect identification, even though it was a weapon that underwent significant adaptations in its operating mechanism. The purposeful alteration of the percussion mechanism and barrel was not an impediment to carrying out the examination, on the contrary, brought striking characteristics that are important axes for the result obtained at the end of the exam.

This way, we can reaffirm the safety and reliability of the Microballistic Confrontation exam, highlighting the diversity of possibilities for its application, which is not limited to conditions of industrially manufactured weapons, since it is mainly based on the individual characteristics of each weapon, This may be an examination carried out with incriminated weapons that have undergone some type of adaptation, as long as they present safe conditions for their handling and collection of standard elements.

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