

BPA analysis as a useful tool to reconstruct crime dynamics Part III

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Abstract. This paper concerns a case of a man fired in a living room by a shotgun. The shooter claimed that an accidental shot had been fired from a frontal position. The Prosecutor asked our lab to reconstruct the dynamics of the events, in order to establish what had really happened, especially regarding the exact positions of the shooter and the victim when the shot was fired. In order to reconstruct the trajectory followed by the bullet and the probable position of the shooter, we examined the report written by the forensic pathologist, analyzed the data acquired at the crime scene (i.e. evidence on bullet impact, measurements, etc.) and applied the BPA technique to bloodstains. At the end of our study, we were able to show that the shotgun was working perfectly excluding any accidental shot and we reconstructed the trajectory by using 3D graphic software (AutoCAD 2000™) and we demonstrated that the shot was not fired from a frontal position. © 2005 Published by Elsevier B.V.

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1. Introduction

The terminal ballistic or effect ballistics examines the bullet trajectory and the consequences it generates during and after the impact of the bullet on the target. The wounds that a shotgun bullet, a rifle or a splinter of metal from an explosive gunlock can produce on a body are of different kind and seriousness, according to the characteristics of the tissues, the static qualities (caliber, weight, shape, etc.) and dynamics qualities (velocity, motion quantity, kinetic energy, etc.) of the bullets [5,6]. When a bullet hits the target, it transfers to the target a certain amount of its energy. The effect of this phenomenon is the damage, the penetration, and so on. During this process, the trauma is as larger and more serious as bigger and quicker is the energy that the bullet has

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transferred to the target. The study of the bloodstain patterns, originated as a consequence of this impact, provided by the interpretation of their position, shape, size and direction (bloodstain pattern analysis (BPA)), could be considered complementary and plays an important role in order to reconstruct the crime dynamics [1–3].

2. Materials and methods

The rifle we received from the Prosecutor consisted of a “Beretta” cal.20 and our tests demonstrated that the gun was still efficient and was working correctly. Afterwards, on August 8th 2001, the Staff of the Ballistic Unit of this Department made an accurate inspection at the scene of the crime (see Fig. 1). From this site inspection, the following deductions were pointed out:

- the window’s curtain presented an irregular tearing (diameter was ~ 1.5 cm);
- under the windowsill, there was an irregularly edged crater (diameter was ~ 1.3 cm);
- in the middle of the above-mentioned windowsill, a deformed portion of the lead bullet was found (most likely Brenneke™);
- close to the central table leg, the wad was found;
- the cartridge was not found either outside or inside the house;
- on the armchair, a series of interesting bloodstains could be observed. A first group lied on the back and showed the classic swipe pattern. A second group lied in the bottom on the right-hand side of the armchair and could be easily interpreted as the continuation of the bloodstains present on the floor, which demonstrated that the position of the armchair was not modified. The overall analysis of these bloodstains identified on the armchair a typical void area that had been produced by the sited position of the victim with his legs slightly widen;
- on the floor a large number of bloodstains could be noticed. They were located radially towards the blood and the brain traces located on the right of the above-mentioned armchair. These bloodstains were produced by the impact of the blood and the brain substance exited by the victim’s head with the blood present on the floor. The presence of other void areas showed that the positions of the chairs around the table had not been modified;
- some more bloodstains and brain substance were also present on the curtain as projected by the effect of the shot.

All measurements and pictures taken were then processed by means of the technical design software AutoCAD 2000™ and a 3D picture was realized in order to allow the

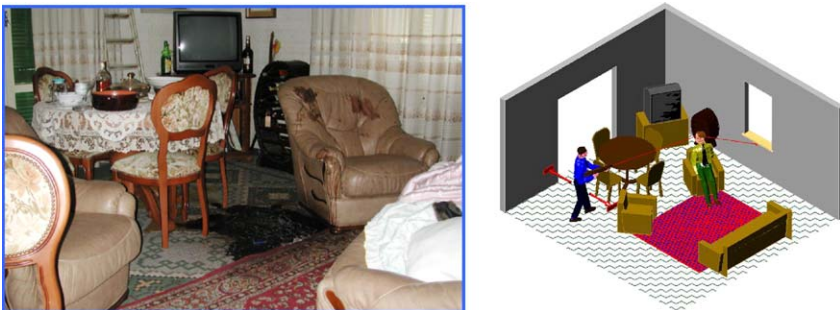


Fig. 1. A picture of the crime scene and view of the 3D reconstruction by means of the software AutoCAD 2000™.

virtual visualization of the environment from different points of view (see Fig. 1). After having reconstructed the environment, the shape of the victim was positioned as he could be when he was shot [4–6].

3. Results

It was hence possible to conclude with a high rate of certainty that the victim, when he was mortally shot, was sitting on the armchair which was close to the window with his legs slightly widen and had his head turned to the right. Furthermore, the right position of the shooter had to be found in the area of the living room, between the door of the terrace and the second armchair and between the bookcase and the round table (distance of the shooting could be about $2 \div 3$ m).

This was fully in contrast with what his wife had declared, saying that his partner has entered in the living room from the door of the corridor, and had accidentally shot the victim frontally, as he was standing up from the armchair.

4. Discussion

This case highlights that:

- it is always crucial to conduct accurate inspection activities and appropriate measurements at the scene of crime;
- bloodstain pattern analysis plays a fundamental role in determining the shooting dynamic, stressing once more how much important it is the periodical update training for the officer that are sent in the crime scene.

Using BPA, it was then been possible to deduct, as previously observed that the victim, very probably, was shot while sitting with his legs slightly widen. Moreover, thanks to the conclusion of the forensic pathologist (wounds located in the temporo-parieto-occipital size of the head), it was also possible to suppose that the victim's head was turned to the right hand side when he was hit. This in particular, together with the above-mentioned morphologic characteristics of the trace left by the bullet impact, permitted to reconstruct the second part of the bullet trajectory, by means of the graphic software AutoCAD 2000™. During this pathway, the bullet had also torn the curtain in front of the window. Moreover, to determine the right position of the shooter, we considered:

- the direction of the second part of the shooting trajectory calculated as above mentioned;
- the impact of blood and brain on the left-hand side of the curtain;
- the positions of the furniture (table, chairs, armchairs, and so on) in the living room.

By elaborating all these parameters with AutoCAD 2000™ graphic software, it was finally possible to calculate the first part of the bullet trajectory and to provide an estimation of the shooting distance, making hypothesis on the right positions of the shooter.

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