

Chapter 2

METHODOLOGY

2.1 Study Design

This was a prospective analytical study.

Since no biological examinations on weapons have ever been performed at the Forensic Science Laboratory (FSL) of the South African Police Service (SAPS), the study could not be analysed from a retrospective perspective.

2.2 Study Setting

Analysis of the discharged weapons was performed in the laboratories of the Biology Unit of the FSL in Pretoria.

All photographs were taken in the laboratories of the Photographic Unit at the FSL. The photographic and video material is secured in a safe at the FSL.

Additional relevant information to be included in this report, such as the presence or absence of a suicide note, was obtained from the dockets on each of the cases and/or from interviews with the relevant investigating officers. Collection of information from the scene of a contact gunshot incident will be done in conjunction with Crime Scene Management, Investigative Support and the FSL in Pretoria.

2.3 Subject Selection

All *available* weapons employed in suspected contact gunshot events in the city of Pretoria were analysed for draw back blood spatter.

Exclusion criteria:

- Weapons found lying in a pool of blood were excluded from the study – in these cases, it would be impossible to prove that any blood present on or inside the weapon originated from back spatter and not from secondary contact with blood.
- Weapons returned to family members or institutions were also excluded, because of the possibility that these weapons might have been wiped or cleaned prior to analysis.

2.4 Study Population

Weapons used to inflict contact gunshot wounds in victims presenting from the greater Pretoria area to the Pretoria Medico-Legal Laboratory (MLL) were requested to be made available for analysis by the appropriate investigating officer during the period of June 2002 to June 2003.

Pretoria was selected as the ideal frame for assembling the study population as it suffers an extremely high incidence of firearm related suicides³⁶ and will therefore facilitate obtaining adequate data for inclusion in this proposed study.

2.5 Sampling Frame

All information concerning blood within the weapons (as well as the additional information to be included in this report) was collected from experimental procedures in the biology and photography laboratories of the FSL in Pretoria.

Pathology reports and docketts compiled by the relevant investigating officers were utilised to obtain information regarding location of weapons on the scene, anatomical site of the entrance wounds, clothing, and location of the body.

Where pathology reports were not effective in providing such information, the relevant investigating officers were contacted and the information obtained via interview.

2.6 Research Procedures

Weapons employed in contact gunshot events were submitted to the laboratories of the Photography and Biology Units for analysis of drawn back blood spatter inside the barrels and on the outside of those weapons.

Contact gunshot events were detected by way of distinguishing contact gunshot wounds from intermediate and distant wounds at the Medico-Legal Laboratory in Pretoria. The relevant docketts of each case were examined for information pertaining to the specific police station involved and appropriate data on the victim, for example, the gender, age, and race.

The investigating officer of each case was contacted and requested to deliver the related weapons to the FSL. During the interviews with investigating officers, additional information was obtained regarding the type and calibre of weapon and the location of the weapon at the scene.

Unofficial protocol regarding the collection of weapons from a crime scene includes appropriate packaging and transport to the appropriate division of the Criminal Record Centre (CRC) in Pretoria (where photographing and fingerprinting are performed) and/or to the Ballistics Unit at the Forensic Science Laboratory.³⁷ Subsequent to photographing and fingerprinting at the CRC, and ballistic testing at the FSL, it is

expected that the weapons be returned to the appropriate police station for safe keeping in the station's SAP13.

Once at the Biology Unit of the FSL, the external aspects of the weapons were photographed. Subsequent to this, the barrels of the firearms were probed internally for visible blood droplets by employment of a baroscope (a thin, elongated tube with a light and minute video camera at the tip).

The dislodged barrel of each weapon was mounted on a vice to stabilise it for inspection. The long, thin probe of the baroscope was manually manoeuvred inside the barrel without touching the internal walls of the barrel. This was done with the objective of visualising any blood droplets drawn back into the barrel. The probing process was recorded and stored on videotape.

Chemical analysis of weapons for blood was done by wiping the inside of the barrel with moist pipe cleaners and staining the pipe cleaners with benzidine. This substance utilises the peroxidase-like activity of heme to produce a blue/purple colour as end product.³⁸

Benzidine is used as a presumptive test for blood and exhibits identical sensitivity and specificity to tetra-methylbenzidine.³⁸ The sensitivity and specificity of the latter have been compared with that of other agents used as presumptive tests for blood, such as phenolphthalein, orthotolidine solutions and leucomalachite green.³⁸

The phenolphthalein has been found to be the best single test for blood, having both the greatest sensitivity and specificity, but this agent is not currently being used in the Police Forensic service.³⁷

The tetra-methylbenzidine (together with orthotolidine) was the most sensitive test of the group. Bearing in mind that tetra-methylbenzidine and benzidine are

indistinguishable in relation to the produced results, it can be assumed that benzidine will also have a sensitivity of one part in 10,000 to 200,000.³⁸

To obtain reliable sensitivity, a maximum of 10 seconds should be allowed for the colour reaction to occur.³⁸ In high blood concentrations the development of the colour will occur within 5 seconds. If the colour develops after 20 seconds, interference colour might have been produced or a false-positive result might have been obtained. The interpretation of the results of this test is dependent on the expertise and experience of the scientist performing the experiment, method of preparation and the blood concentrations on the surface being tested.

However, the employment of this stain must be done with great care as benzidine has been known to be a carcinogenic agent, especially in long-term occupational exposure.³⁶ It is suggested that analysis using benzidine as dye must preferably be done in a well ventilated area using latex gloves for skin protection.

Examination of mortuary docket of each case will be done and any variables able to influence draw back of blood into the muzzle of the weapon (like clothing or the presence of hair) will be noted. These docket will be handed back to the investigating officer.

2.7 Ethical Considerations

Consent to use information from the relevant docket was obtained from the head of the Detective Services in Pretoria. Consent for employing the statistics acquired from the biology laboratory after analysis of the discharged weapons, was obtained from the officer commanding the Biology Unit of the Forensic Science Laboratory of the SAPS in Pretoria.

Complete anonymity of all victims was maintained throughout the study. Use of case reference numbers deprecated the risk of disclosing personal information and all reports and findings are stored on the researcher's personal computer, protected by a password.

2.8 Data and Documentation

Confidentiality

Data obtained from the dockets and investigative officers of each case was handled with care as to protect the confidentiality thereof. All reports are stored on the researcher's personal computer protected, by a password.

Use was made of case reference numbers only, thereby minimising the risk of disclosing personal information.

Collection of Data:

Data was collected on grounds of the presence of blood penetration into the firearm. If the appropriate laboratories could verify the presence of blood droplets, the weapon was considered "positive for drawn back blood" and the type and calibre of the weapon recorded. The latter recordings were also done in the case of "negative tests".

Additional forensiometric markers of suicide such as location of weapon on the scene, anatomical site of entry wounds, bloodspatter on the outside of the weapon, presence of a suicide note, gender, age, race, etc., will also be entered in the final report.

All problems and additional information stumbled upon during the course of the study was also recorded and entered into this final report.

Processing of Data:

All the numerical data was captured onto a data capture sheet. A printout of the results on all firearms tested by the Forensic Science Laboratory was forwarded to me by the FSL. Data pertaining to the study will be handed over to a statistician.

These analyses will involve the use of standard mathematical formulas to calculate the percentage of weapons that tested positively for drawn back blood in the barrels.

The type and calibre of weapon and the anatomical sites of entry will be correlated with the presence or absence of back spatter.

2.9 Funding

No additional funding was necessary for any laboratory tests performed on the firearms themselves. The investigations and analyses constituted an integral part of the investigative protocol for individual fatalities.

2.10 Time Frame

The collection of weapons used in contact gunshot incidents was done over the period of June 2002 to June 2003. This represented the time frame available to the researcher to fulfil the requirements for the M.Sc. degree.

The suicide caseload of the Medico-Legal Laboratory in Pretoria is calculated to be approximately 15, 3 percent of the 1 748 cases handled annually. Of these 268 suicide

cases, 41 percent is due to gunshot wounds.³⁹ This means that the Laboratory supervises roughly 107 suicidal gunshot fatalities annually and almost nine cases a month. All of these cases are generally contact gunshot wounds.

This means that the presented time frame will allow for approximately 108 cases of suicide, which will be sufficient to yield legitimate statistics. The number of contact homicidal or accidental gunshot fatalities was – as expected – minimal, but was also added to the study.

2.11 Reporting

The final results will be submitted to a peer-reviewed scientific journal with intent to publish.
