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May 08 2025
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Exhibit D

Mikal D. Mahdi's Autopsy Report by Dr. Jonathan L. Arden

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5 May 2025

Report Regarding Firing Squad Execution of Mikal Mahdi

Introduction

I have been retained by the attorneys for Mikal D. Mahdi to provide consultation in the field of forensic pathology, which I have practiced for 40 years. After receiving my MD degree from the University of Michigan in 1980, I completed training in anatomic pathology at the New York University Medical Center (1980-1983) and in forensic pathology at the Office of the Chief Medical Examiner for the State of Maryland (1983-1984). I have been certified in both anatomic and forensic pathology by the American Board of Pathology since 1985. I am currently licensed to practice medicine in five states. I spent the first 20 years of my career as a government-employed medical examiner, including nine years with the Office of Chief Medical Examiner for the City of New York where I finished as First Deputy Chief Medical Examiner, and more than five years as the Chief Medical Examiner of Washington, DC. I am currently President of Arden Forensics, PA, a consulting practice in forensic pathology and medicine, and I hold a part-time appointment as a Forensic Pathologist in the Office of the Chief Medical Examiner for the State of West Virginia.

I have testified as an expert witness more than 900 times in various state and federal courts, depositions, grand juries, and hearings. My fees are not contingent upon the outcome of any case in which I consult.

Materials Reviewed

I have reviewed the following materials regarding the execution by firing squad of Mikal Mahdi:

- Report of Postmortem Examination (i.e., autopsy report) of Mikal Mahdi, from Professional Pathology Services, PC, 4/14/2025
- One autopsy photograph of the entrance wounds of Mikal Mahdi
- One photograph of the container of the ballistic fragments recovered at autopsy.

I also spoke by telephone on 4/24/2025 with Dr. Bradley Marcus, the pathologist who performed the autopsy of Mr. Mahdi.

I have reviewed the autopsy report and photographs of the prior firing squad execution of Brad K. Sigmon, as well as press coverage of the executions of Mr. Mahdi and Mr. Sigmon (including the video of the press conference after the execution of Mr. Mahdi, in which the events of the execution were described by the three press observers). I have also relied upon my education, training, knowledge, and experience as a physician, forensic pathologist, and a medical examiner.

Synopsis of Pertinent Facts

According to information shared by the State during prior litigation, and witness reports, South Carolina's firing squad execution protocol entails placing a target over the prisoner's heart, securing him into a chair, and having three shooters fire live ammunition (frangible bullets that break apart on impact) at the target from a distance of about 15 feet. I was retained by the Plaintiffs and testified as an expert in the *Owens vs. Stirling* litigation, for which I was provided the South Carolina firing squad protocol to review.

Mr. Mahdi was executed by firing squad at 6 p.m. ET on 4/11/2025. The AP reported the following description of the execution:

> *Mahdi, 42, cried out as the bullets hit him, and his arms flexed. A white target with the red bull's-eye over his heart was pushed into the wound in his chest.*
>
> *Mahdi groaned two more times about 45 seconds after that. His breaths continued for about 80 seconds before he appeared to take one final gasp.*
>
> *A doctor checked him for a little over a minute, and he was declared dead at 6:05 p.m., less than four minutes after the shots were fired.*

An autopsy was performed on Mr. Mahdi on 4/12/2025. The Final Anatomical Diagnoses included:

I. MULTIPLE, DISTANT RANGE, PENETRATING GUNSHOT WOUNDS TO THE LEFT CHEST WITH RESULTANT:
- *A. SKIN AND SUBCUTANEOUS TISSUE DISRUPTION WITH ASSOCIATED HEMORRHAGE.*
- *B. RIGHT VENTRICLE PERFORATIONS WITH ASSOCIATED HEMORRHAGE.*
- *C. LEFT HEMOTHORAX (~1000 ML).*
- *D. MACERATION OF THE LEFT LIVER LOBE.*
- *E. MACERATION OF THE PANCREAS.*
- *F. HEMOPERITONEUM (~500 ML).*
- *G. LEFT LOWER LUNG LOBE PERFORATION WITH ASSOCIATED HEMORRHAGE.*
- *H. SOFT TISSUE AND BONE DISRUPTION.*
- *I. MULTIPLE COPPER COLORED AND GRAY METAL PROJECTILE FRAGMENTS RECOVERED.*

The cause of death was listed in the autopsy report as “multiple gunshot wounds to the chest.”

The autopsy report described two entrance gunshot wounds to the left chest, with the comment “It is believed that gunshot wound labeled (A) represents two gunshot wound pathways.” As demonstrated in the single autopsy photograph, the two entrance wounds were on the lowest portion of the left-front chest; they were within ¼ inch of each other vertically, and 1 inch apart horizontally (being 1.4 and 2.4 inches to the left of the midline, respectively). Each entrance gunshot wound was approximately ½ inch in diameter, with an abrasion border. The report described two separate wound paths arising from the two entrance wounds:

> Wound designated as “A” (i.e., the one slightly higher and to the right) injured the chest wall (including fracture of the sternum, or “breastbone”), was described to have perforated the pericardial sac (which is around the heart) and the right ventricle of the heart (injuries not otherwise described), macerated the left lobe of the liver and the pancreas, caused left hemothorax and hemoperitoneum (i.e., blood in the left chest cavity and the abdominal cavity, respectively), and terminated with disruption of the 11th thoracic vertebra.
>
> Wound designated as “B” (i.e., the one slightly lower and to the left) was described to have perforated the pericardial sac, the right ventricle of the heart (injuries not otherwise described), and the left lower lung lobe, and terminated with disruption of the 10th intercostal space (i.e., the space between the 10th and 11th ribs).

Both wound trajectories were described as “backward, downward and to the right,” and the descriptions of both wounds included the statement that “Multiple copper colored and gray metal fragments are recovered.”

I was provided one autopsy photograph that depicted the two entrance gunshot wounds from a medium distance.

The autopsy report indicated that no toxicology testing was performed. The report did not mention whether any clothing was received with the body, nor whether postmortem radiographs (i.e., “X-rays”) were taken.

During our telephone call, Dr. Marcus informed me that he only took two photographs incident to this autopsy: the one of the entrance wounds, and one of the collected recovered projectile fragments. The photograph of the entrance wounds was to document the unexpected finding that there were two apparent entrance wounds, not three. No close-up photographs of the fine details of the gunshot wounds, and no internal photographs to document the internal injuries were taken (nor was the condition of the body generally documented photographically). No postmortem radiographs (“X-rays”) were taken to document the gunshot wounds.

Dr. Marcus also informed me that he had received clothing with Mr. Mahdi, which he did not examine, describe, or document. He put it in a bag and sent it with the body to the funeral home.

Dr. Marcus informed me that he was surprised to find only two wounds, which caused him to send the photograph of the wounds to the SC Department of Corrections, and discuss the issue with their representative. He related that he was told about the practice shootings by the firing squad members, in which it was represented to him that those targets sometimes had only one or two holes from the three bullets. As discussed below, passage of more than one bullet through a typical entrance wound is virtually unheard of, and Dr. Marcus acknowledged that such an occurrence would be "remote" in his estimation.

Dr. Marcus also expected the entrance wounds to be higher on the chest. He related that he was familiar with the internal injuries of Mr. Sigmon (which obliterated both ventricles of the heart), but in Mr. Mahdi he found only the four perforations of the walls of the right ventricle (two front, two back, representing two projectile paths through the chamber) that were about ½ inch apiece. He did not expect to find such severe damage to the liver as was present in Mr. Mahdi.

Analysis and Opinions

Gunshot Wounds: Number, Locations, and Trajectories

The South Carolina firing squad execution protocol consists of three shooters firing rifles with live ammunition from a close distance (approximately 15 feet) at a target attached to the clothing that is intended to be placed over the heart. The reasonable expectation in that circumstance is that three entrance wounds on the front-left-central chest (i.e., approximately over the heart) will result. Indeed, the autopsy of Mr. Sigmon did demonstrate three separate entrance wounds in his central-front chest. Contrary to the expected findings as listed above, Mr. Mahdi had only two entrance wounds in his chest, which were located on the lowest area of the left front chest, i.e., almost at the abdomen. No definitive explanation for these discrepancies currently exists.

We currently have no evidence to explain why there were two, rather than three, entrance wounds. The autopsy report commented, "It is believed that gunshot wound labeled (A) represents two gunshot wound pathways." No source or basis for this comment was provided in the report (which is further discussed below in the context of my discussion with Dr. Marcus). Having seen and assessed thousands of gunshot wounds during my 40-year career in forensic pathology, it is extraordinarily uncommon for more than one bullet to enter the body through one entrance wound. Moreover, if two bullets did enter through one wound, that would create an atypical entrance wound, which would be larger and more irregular in configuration than a typical entrance wound made by one projectile of the same ammunition striking that part of the body. The single autopsy photograph of Mr. Mahdi that was provided demonstrated two typical entrance gunshot wounds; neither is large or irregular, and both have regular "collars" of abrasion on their borders (which is one of the most definitive features of a typical entrance gunshot wound). Furthermore,

the autopsy report described two internal wound trajectories, not three. In total, the number and configurations of the entrance wounds, and the described internal wound paths, are highly consistent with Mr. Mahdi having been struck by two bullets, not three.

The entrance wounds were also misplaced in comparison to their expected locations. The entrance wounds were at the lowest area of the chest, just above the border with the abdomen, which is not an area largely overlying the heart. The location of the target relative to his heart cannot be determined, since we have no photographs or video of the target in place before he was shot. We also have no examination of the clothing, to try to compare clothing defects (both numbers and locations) with the entrance gunshot wounds of the body (see below).

The two wound trajectories were described as "backward, downward and to the right."[1] Given that the entrance wounds were on the lowest area of the chest and not obviously overlying the heart, and that the trajectories had a downward component (even if not sharply so), it is predictable that the heart might not be injured severely (or even at all) from those shots, and that the majority of the internal damage would be to organs and structures in the upper abdomen or the lower portions of the lungs (because the rear portions of the lower lobes of the lungs are behind the domes of the diaphragms, placing them behind some of the upper abdominal contents). In fact, that is what was found at autopsy; Mr. Mahdi sustained substantial disrupting injuries to his liver and pancreas, and perforation of the lower lobe of the left lung, but only two perforations of the right ventricle of the heart, comprising two holes in the front, and two holes in the back, of that ventricle (as was subsequently described to me by Dr. Marcus).

Performance and Documentation of the Autopsy

The following discussion of the performance and documentation of the autopsy is based on both my review of the autopsy report and the one autopsy photograph that was provided, and the information provided by Dr. Marcus in the telephone call I had with him. (Although I am critical of some aspects of the autopsy, I note that Dr. Marcus was not only willing to discuss the autopsy with me, but he was cordial, professional, and gracious with his time during our call.)

When Dr. Marcus found only two entrance gunshot wounds, he related that he was told by SC Department of Corrections about the practice shootings by the firing squad members, in which it was represented to him that those targets sometimes had only one or two holes from the three bullets. That has not been independently verified, but I note that targets do not respond to gunshots the same way that skin and tissue does, so even if accurate, that may not be applicable to or dispositive of the appearances and interpretations of the entrance gunshot wounds of the body of Mr. Mahdi. As was discussed above, passage of more than one bullet through a typical entrance wound is

[1] Wound trajectories are described relative to the body in normal anatomical position, in which the body is envisioned standing upright, facing the viewer, with the arms at the sides. In this construct, front, back, left, and right refer to those of the body; up is toward the head and down is toward the feet.

virtually unheard of. (As a further comparison, Mr. Sigmon had three distinct and separate entrance wounds, which, although closely spaced, had a 1½ inch vertical spread.)

Only one photograph, which depicted the two entrance gunshot wounds from a medium distance, was taken to document this autopsy. No close-up photographs of the fine details of the gunshot wounds, and no internal photographs to document the internal injuries were taken (nor was the condition of the body generally documented photographically). No postmortem radiographs ("X-rays") were taken to document the gunshot wounds. The lack of detailed photographic and radiological documentation of the gunshot wounds does not meet forensic autopsy performance standards and accepted practices, which dictate that the findings of injuries that establish the cause of death must be preserved for independent review or verification.[2] Such rigorous documentation is especially critical for deaths that carry special interest or importance, such as homicides and deaths in custody, both of which pertain to the death of Mr. Mahdi.

Clothing was received with the body of Mr. Mahdi, which was not examined, described, or documented. Standard practice in the forensic postmortem examination of a gunshot victim includes examination of the clothing with correlation of any clothing defects to the cutaneous gunshot wounds.[3] Given the obvious misplacement of the gunshot entrance wounds to Mr. Mahdi, correlation of those wounds with the clothing (and the target, if provided with the clothing) was essential.

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[2] National Association of Medical Examiners *Forensic Autopsy Performance Standards*, 9/22/2024 edition:

> *Standard E14 Photographic Documentation*
> *The forensic pathologist or representative shall:*
> > *E14.1 photograph injuries unobstructed by blood, foreign matter, or clothing*
> > *E14.2 photograph major injuries with a scale*
>
> *Standard G25 Radiography*
> *The forensic pathologist or representative shall:*
> > *G25.3 X-ray gunshot victims.*
>
> *Standard D9 Preliminary Procedures*
> > *D9.5 forensic pathologist or representative photographs decedent as presented.*

[3] Ibid.: *Standard D9 Preliminary Procedures*

> *These standards underscore the need for assessment of all available information prior to the forensic autopsy to (1) direct the performance of the forensic autopsy, (2) answer specific questions unique to the circumstances of the case, (3) document evidence, the initial external appearance of the body, and its clothing and property items, and* ***(4) correlate alterations in these items with injury patterns on the body****…. (emphasis supplied)*
> *Preliminary procedures are as follows:*
>
> *D9.6 forensic pathologist documents and correlates clothing findings with injuries of the body in criminal cases.*
> *D9.9 forensic pathologist or representative photographs or lists clothing and personal effects.*

The lack of adequate photographic and radiographic documentation of the gunshot wounds and of the body in general, as well as the lack of examination and documentation of the clothing, are in direct contrast to the autopsy of Mr. Sigmon, the prior person executed by firing squad in South Carolina. The autopsy of Mr. Sigmon, which was performed by a pathologist in the same pathology practice that conducted the autopsy of Mr. Mahdi, included adequate photography, radiologic examination, and a report of at least a cursory examination of the clothing.

Conscious Pain and Suffering

The Supreme Court of South Carolina cited to my testimony[4] that established “that the outer limit of the period of time in which an inmate will suffer pain—unless there is a massive botch of the execution in which each member of the firing squad simply misses the inmate’s heart—is hardly more than fifteen seconds.” The import of my testimony was that execution by firing squad conducted by shooting at the heart does not merely permit that the subject will experience intense conscious pain and suffering, it guarantees it. If the procedure is done correctly, the heart will be disrupted, immediately eliminating all circulation (as was seen in Mr. Sigmon, where both cardiac ventricles were obliterated). In that circumstance of sudden, complete cessation of circulation, a person will remain conscious for approximately 15 seconds, during which he will experience excruciating pain from having been shot in the chest. The three rifle shots to the chest will disrupt skin and soft tissues, which is painful, but more importantly the gunshots will break multiple bones (i.e., ribs and sternum). Multiple broken bones in the chest cage will be extremely painful, especially with any movement, such as breathing, which will lever and move the bones at the fracture sites. In addition, breathing will be difficult after the gunshots, not only because the fractures will disrupt the mechanical structure of the chest cage necessary for efficient breathing, but also because the underlying lung will likely be damaged. The feeling of not being able to breathe adequately, called air hunger, is frightening and terrifying, over and above the severe pain from the gunshot injuries. But if the shots are not placed well and the heart is not obliterated, then some circulation will continue, even if only briefly, which will result in a period of consciousness longer than approximately 15 seconds. This was clearly the case with Mr. Mahdi: his ventricles were not disrupted, so he did continue to have some (albeit compromised) circulation after he was shot, permitting him to remain conscious for more than 15 seconds; it is unlikely that he remained conscious for more than a total of approximately 30 – 60 seconds. I note that the press observers described that Mr. Mahdi cried out when he was shot, then made two groans about 45 seconds later, and made a low moaning sound about a minute and a quarter after he was shot. Although groaning or making similar noises may be conscious or involuntary, and is not definitive evidence of consciousness, in the context of what we know about his cardiac injury, Mr. Mahdi’s groaning at about 45 seconds after he was shot is consistent with representing his waning moments of consciousness.

Summary and Conclusion

In summary, in the firing squad execution of Mr. Mahdi, the shooters missed the intended target area, and the evidence indicates that he was struck by only two bullets, not the prescribed three. Consequently, the nature of the internal injuries from the gunshot

[4] *Owens v. Stirling*, 443 S.C. 246 (2024), at p. 18

wounds resulted in a more prolonged death process than was expected had the execution been conducted successfully according to the protocol. Both the forensic medical evidence and the reported eyewitness observations of the execution corroborate that Mr. Mahdi was alive and reacting longer than was intended or expected. Mr. Mahdi did experience excruciating conscious pain and suffering for about 30 to 60 seconds after he was shot.

All opinions in this report are expressed with reasonable medical certainty. I reserve the right to amend any statements or opinions if presented with additional significant information, as well as the right to rebut opinions expressed within my areas of expertise.

Yours truly,
Arden Forensics, PA

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President