

A Neuroforensic Analysis of the Wounds of President John F. Kennedy: Part 2—A Study of the Available Evidence, Eyewitness Correlations, Analysis, and Conclusions

To the Editor:

We write to respond to the article by Dr. Michael Levy et al. (65). We write as individuals who worked with the Assassinations Records Review Board (ARRB) in the mid-1990s to help decipher JFK's conflicted medical and autopsy evidence, as researchers who have studied the thousands of pages the ARRB contributed to this topic, and two of us (CHW and GLA) as physicians whom Dr. Levy named as among the few ever allowed to see JFK's still-restricted autopsy photographs and x-rays.

We commend the authors' endeavors to "present that which is currently known regarding the nature of the wounds sustained by President Kennedy," and to "point out areas of discrepancy and controversy in the interpretation of the data and to attempt to provide a resolution of the controversies." The complex nature of this conflicted data, the abundance of new information from declassified files and the revelations from the ARRB clearly merit such serious attention.

Unfortunately, *Neurosurgery's* effort cannot be judged a total success. There are numerous errors of fact and interpretation that cry out to be corrected. The failure stems from the authors' incomplete understanding of both "old" and "new" evidence—how the JFK autopsy evidence looked before the ARRB shed new light on the subject in the mid-1990s, and how it looks now with the benefit of the new light.

Dr. Levy uses a "six-major-questions" approach to elucidate the forensic implications of JFK's wounding. Such a simplified approach might work in a simple case but it doesn't work here. In the Kennedy case, we encounter contradictions piled on contradictions with respect to the known facts as well as misleading reportage from a number of subsequent official investigations. Dr. Levy's simplified approach has no chance against a fact pattern of such staggering complexity.

First, there is JFK's appallingly shoddy autopsy and the questions it left. Given the chief prosecutor's destruction of original autopsy notes (only recently fully revealed) and the contradictory sworn statements of the autopsy team, we are left with more questions than answers concerning what was actually observed during the autopsy.

Second, there remains the baffling character of the purportedly "authenticated" autopsy photos. As opposed to what Dr. Levy says, these photos never really were authenticated. According to recently released documents, the images failed the only authentication test ever applied to them. Moreover, two autopsy witnesses and Dr. Levy's co-author [Dr. Robert Grossman] denounced the photos as lacking verisimilitude. JFK's three prosecutors and both autopsy photographers also swore under penalty of perjury that the extant file of photos is incomplete.

But the real Achilles' heel of Dr. Levy's analysis is the unreliability of his sources. The new ARRB-released files have shown that both Dr. Levy's primary sources, the observations of various witnesses to JFK's injuries, and his secondary sources, the subsequent reviews or reenactments of aspects of JFK's murder—the kinds of sources one would normally be able to turn to with confidence—are not consistently reliable.

With scarcely an explanation, Dr. Levy discards the sources that have previously been the mainstay in discussions of JFK's injuries—the numerous government forensic experts of the Clark Panel, the Rockefeller Commission, and the House Select Committee. Whereas a case can be made that these government-picked experts tended to make errors that supported the government's position in the Kennedy case, an argument that one of the present authors has in fact made (1-5), Dr. Levy does not make that argument. He argues instead for wholesale acceptance of the forensic conclusions of the imperfect sources he prefers, invoking experienced forensic experts only when they suit his purposes.

That is not to say Dr. Levy has not built a powerful case for a single assassin. Indeed, he has. But he has done it principally by using primary and secondary building blocks of dubious reliability. And he has even used them in a way that suggests a failure to grasp evidence that has been widely understood for more than twenty years.

A striking example of Dr. Levy's failure to understand evidentiary points long since generally understood can be found in the undue weight he gives to the meaning of some bent threads that were supposedly found at the edges of the bullet holes in JFK's clothing. He mentions this evidence, which dates back to the Warren Commission, four times. He lists it as the third of only five "primary sources of information" essential to achieving a clear understanding of JFK's injuries. Describing what he says was found in JFK's clothes during the "initial examination by the FBI laboratory," he reproduces a quote from the 1979 House Select Committee on Assassinations' [HSCA's] Forensics Pathology Panel [FPP]:

The hole in the front of the shirt was a ragged, slit-like hole and the ends of the torn threads around the hole, were bent outward. These characteristics are typical of an exit hole for a projectile. (42)

Although this quotation appears in the FPP's report, it did not originate there. It actually traces to a letter FBI Director J. Edgar Hoover wrote to the Warren Commission in 1964 (42, 92). Dr. Levy presents it as if the FPP (including Dr. Wecht) had agreed with the implications of the FBI Lab's finding that fibers were bent in a suggestive direction. The FPP report itself, however, leads to the exact opposite conclusion. In fact, as the FPP made clear in the sentence following the one Dr. Levy quotes, the bent fiber story was entirely concocted by Mr. Hoover:

While the FBI lab's initial description did not offer evidence concerning the direction of the fibers, the observations in this (Hoover's) letter were substantive evi-

dence of the direction of the penetration, provided that the position of the threads had not changed in the interim.

It added that:

As stated previously, the panel itself cannot assess evidentiary significance to the fiber direction because of the numerous intervening examinations. (44)

By selective quotation, Dr. Levy's readers were given no hint of the FPP's misgivings. Nor were readers informed that nowhere in the FBI's initial lab report on JFK's clothing was there any mention of fibers being bent, inward or outward (41, 92). Even the FBI lab expert who first examined the clothing was reluctant to take this "evidence" very seriously. He offered the Warren Commission the same caveat the FPP had come up with: JFK's bent shirt fibers were indicative of exit only "assuming that when I first examined the shirt. . . it had not been altered from the condition it was in at the time the hole was made" (80).

Similarly, Dr. Levy excised another FPP caveat when he again selectively quoted the HSCA to say the FBI had found that the fibers around the bullet hole in the back of JFK's shirt were suspiciously bent inward. It turns out that Hoover's letter was also the sole source for this second bent fiber story. And about those fibers the FPP again gave a warning that Dr. Levy omitted:

The intervening handling of the clothing prevents the panel from drawing any independent conclusions based on its own observations of the defect and surrounding fibers. (41)

The point here is not that there is *no* evidence JFK was shot from behind. It is that this particular Warren Commission pillar that Dr. Levy uses to build his case turns out to be more of a tender reed: it was discredited in the same government document he cites to support it.

Dr. Levy's selective use of evidence is no reason to suppose bad faith. Instead, it suggests haste and a lack of familiarity with the relevant literature on the subject. There is no shortage of similar examples that lead to the same conclusion, which, when elucidated, help both our understanding of the still-unresolved mysteries of JFK's injuries and the tendentious manner in which the government has heretofore handled them.

Dr. Levy recycles one of the Warren Commission's most discredited myths, namely, that a Warren Commission ballistics expert had successfully duplicated JFK's injuries in simulation shooting tests with cadaver skulls. "That (test) bullet," Dr. Levy wrote, "blew out the right side of the reconstructed cranium in a manner very similar to the head wounds of the President" (65). [Except for Dr. Levy's using the word "cranium" rather than "skull" as was originally written, this sentence is a verbatim quote from page 585 of the Warren Report, sans the appropriate quotation marks (72).]

And, indeed, a ballistics authority *had* presented photographs to the Warren Commission depicting his test results, testifying that they showed that: "This particular skull blew out the right side in a manner very similar to the wounds of

the President . . . We found that this bullet could do exactly—could make the type of wound that the President received" (75).

A look at the same test photographs the Warren Commission found so persuasive (77) (Fig. C1) prodded Warren Com-

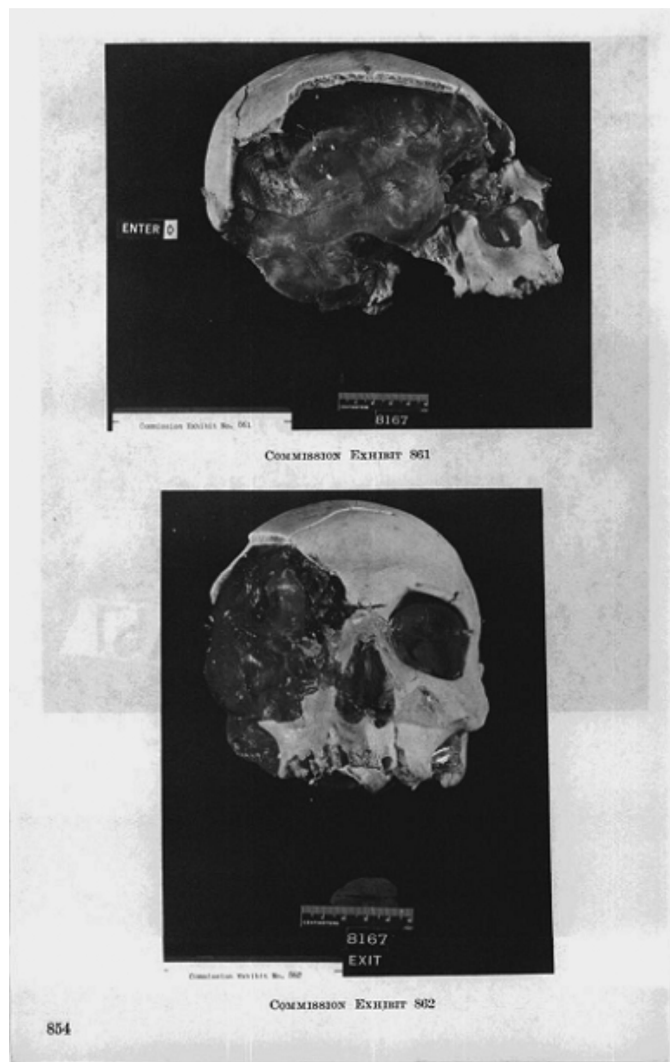


FIGURE C1. These photographs, published by the Warren Commission as Exhibits #861 and #862 (77, 78) depict an experimental skull after it was shot in Warren Commission experiments intended to replicate JFK's injuries. The ballistics expert who performed these experiments, Dr. Alfred Olivier, presented these images to the Warren Commission and testified that, "This particular skull blew out the right side in a manner very similar to the wounds of the President." The images show complete loss of the right orbit, the upper portion of the malar bone, and the right side of the frontal bone. JFK had lost none of his orbit or malar bone, and he had apparently lost only the superior-posterior portion of his right frontal bone. Neither the Commission's expert, Dr. Olivier, nor any of the Commissioners noted the stark differences between the injuries to the experimental skull and those JFK sustained as depicted in the Rydberg diagram (Fig. C2).

mission defender John Lattimer, M.D., to scoff, “Why did the attempts by government ballistics experts to reproduce President Kennedy’s head wounds not produce skull wounds more similar to [Kennedy’s]?” (62). Indeed, the photographs show the bullet had entered from the rear at approximately the level of the test skull’s external occipital protuberance, as per the autopsy report. The exit wound involved the destruction of virtually the entire right side of the skull, including the entire right frontal bone in the area of the forehead, the entire orbit, and the superior aspect of the malar bone (77, 78).

JFK, by contrast, had no injuries to any of those areas, either described in the autopsy report, or depicted in the Rydberg diagrams approved and published by the Commission (79) (Fig. C2). Nor are any visible in the set of autopsy photographs that are kept in the National Archives (2) or in the late frames of the 8-mm amateur film of the murder, the Zapruder film (94). But had Oswald, in fact, fired the fatal shot the way the Warren Commission said he had, it’s most likely that JFK’s face would have resembled the test skull.

This example reveals that Warren Commission experts cannot always be trusted and that the Warren Commission was capable of being blind to the obvious misstatements of scientific experts who were telling it what it wanted to hear. Hence,



FIGURE C2. The Warren Commission was given to understand that Kennedy’s cranial damage was as rendered in this diagram, an image that was produced by H.A. Rydberg under the direction of JFK’s chief prosecutor, Dr. James Humes. Dr. Humes presented this image to the Warren Commission (Commission Exhibit #388. On-line at: http://history-matters.com/archive/jfk/wc/wcvoles/wh16/html/WH_Vol16_0504b.htm (79)) and vouched for its accuracy in rendering JFK’s cranial damage. No comment was ever made by the Warren Commission about the discrepancies between the injuries apparent in this diagram and those visible in the original autopsy diagram (Fig. C3A), or those that resulted from Dr. Olivier’s “experimental duplication” of JFK’s injuries (Fig. C1).

there are risks in reporting the official statements of what Dr. Levy calls “secondary sources” without squaring them against the evidence.

Although Dr. Levy’s primary sources of information figure prominently in his analysis, he overlooks one that is nothing if not primary: the hand-written notes taken during JFK’s autopsy. There is simply no substitute for hard data collected during a procedure. Moreover, conclusions drawn without the availability of raw lab data are subject to later doubt. To a significant extent, that is the case here.

Two of the three sets of original autopsy notes were willfully destroyed—those of JFK’s chief pathologist, James H. Humes, M.D., and apparently those also of his forensics consultant, Pierre Finck, M.D. Moreover, there are contradictions between the surviving notes and the official autopsy report, most notably about the size of JFK’s cranial wound.

JFK’s autopsy report states: “there is an actual absence of scalp and bone producing a defect which measures approximately 13-cm. in greatest diameter” (71). The surviving autopsy notes, by contrast, depict the top of JFK’s skull and include the number “10,” with arrows pointed right to left, and the number “17” with arrows pointed anteroposteriorly (8, 45) (Fig. C3A). Dr. Boswell, who had prepared this diagram on the night of the autopsy, was asked under oath what the notations meant in 1996.

ARRB Counsel T. Jeremy Gunn: “Would it be fair to say that when you first examined the body prior to any arrival of fragments from Dallas, the skull was missing from approximately those dimensions of 10 by 17?”

Dr. Boswell: “Yes.” (9)

Under oath before the HSCA in 1977, Dr. Boswell had said the same thing:

Forensics Pathology Panel Chairman, Dr. Michael Baden: “Could you explain the diagram on the back?”

Dr. Boswell: “Well, this was an attempt to illustrate the magnitude of the wound again. And as you can see, it’s 10 centimeters from right to left, 17 centimeters from posterior to anterior.” (45)

In an interview with the ARRB in 1996, Dr. Boswell marked a model of a human skull to denote the gaping skull defect he found when he examined JFK in the morgue. Diagrams prepared by Doug Horne of the ARRB rendering Dr. Boswell’s skull markings onto two-dimensional images show a huge gaping wound fully consistent with the dimensions and the diagram he prepared on the night of the autopsy (Fig. C3, B and C).

The ramifications of JFK’s gaping cranial wound actually being 17-cm rather than 13-cm in size, as per the official autopsy report, are beyond the scope of the present discussion (5). The relevance of JFK’s original autopsy notes here is that some notes did survive, Dr. Boswell’s, and, so merited, being listed as a “primary source of information.” The only attention Dr. Levy pays to Kennedy’s autopsy notes is to remark that Dr. Humes destroyed some of them, and he leaves an illuminating part of that story untold.

Dr. Levy offers the same explanation for Dr. Humes' destroying original autopsy notes that the prosecutor himself gave to the HSCA in 1978 (47), John Lattimer, M.D., in 1980 (64), as well as the Journal of the American Medical Association in 1992 (34), the ARRB in 1996 (10), and Senator Arlen Specter in 2000 (74). Namely, that Dr. Humes had burned the evidence out of fear JFK's blood-stained autopsy notes would become objects of morbid curiosity in the same way the antimacassar (protective doilies) on President Lincoln's chair had so become, stained as they were with the President's blood.

Overlooked was the fact that in 1998 the ARRB had pointed out that the prosecutor had given a different version of events to the Warren Commission (39). Worse, there is at least one other reason to seriously doubt Dr. Humes' explanation. He did not destroy Dr. Boswell's "face sheet" autopsy notes, which also bear the President's bloodstains (8) (*Fig. C3A*).

That fact prompted an amusing exchange when ARRB counsel T. Jeremy Gunn, J.D., Ph.D., asked Dr. Humes, "Do you see any inconsistency at all between destroying some handwritten notes because they contained blood on them but preserving other handwritten notes that also had blood on them?" "Well," Dr. Humes answered, "only that the others [that I destroyed] were of my own making. I didn't—wouldn't have the habit of destroying something someone else prepared" (11). In fact, notes that Dr. Finck prepared on the night of the autopsy are also missing. So unless someone else in the military destroyed those notes, Dr. Humes must have done it. For according to official records including his own affidavit (76, 90), Dr. Humes took sole possession of all the notes, including Dr. Finck's (21).

This odd episode buttresses again the point that Dr. Levy's primary sources cannot always be relied upon. This includes JFK's chief prosecutor, Dr. Humes, someone whose word on Kennedy's autopsy findings Dr. Levy takes at face value. He provides an additional reason to wonder about Dr. Humes, but fails to draw the obvious inference. He accurately recounts that Dr. Humes originally put the entrance to the fatal wound low in the back of JFK's cranium. But in 1978 before the HSCA, under oath and under pressure to move the wound higher, Dr. Humes turned about and said the wound was significantly higher, exactly where the HSCA wanted it to be. Then, in a Journal of the American Medical Association interview in 1992, he reversed course again and put it lower (33). Finally, in 1996, Dr. Humes told the ARRB in sworn testimony that the wound was low. Dr. Humes' oscillating testimony is far from unique among Dr. Levy's primary sources of information. It is the abundance of peculiar oscillations and contradictions such as this that make the JFK evidence so frustrating and perplexing.

As we will show, Dr. Humes and several of Dr. Levy's primary sources adjusted their memories to fit the government's preferred "lone nut" conclusion. Unfortunately, Dr. Levy nowhere explores this, even in his discussion of the all-important autopsy photographs. Instead, the photos win his endorsement on grounds the HSCA had authenticated them. He sidesteps how incompatible they are with Dr. Gross-

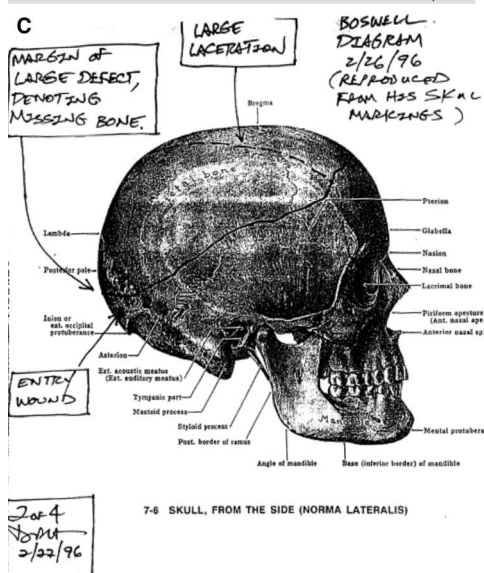
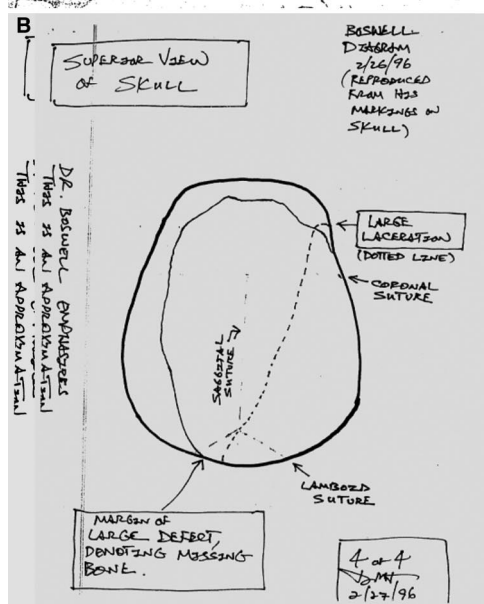
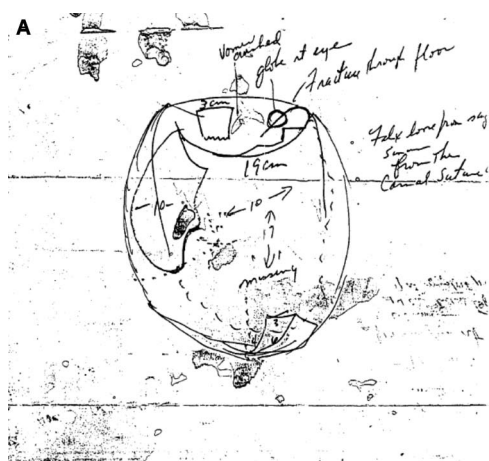
man's description, as well as the fact that Dr. Grossman flatly told the ARRB they didn't show what he saw. Nor does he explore new evidence uncovered by the ARRB that shows that both government investigators and the autopsy team mishandled this evidence. But before the ARRB knocked the struts out from under them, JFK's autopsy photographs had offered solid support for the government's position in the case.

Besides the HSCA's claim it had authenticated them, the autopsy pictures got an additional boost from four members of the autopsy team: Drs. Humes and Boswell, the attending radiologist, Dr. John H. Ebersole and John Stringer, the autopsy photographer. After being allowed to see the grisly stills for the first time in 1966, the four men signed an affidavit [prepared by the U.S. Justice Department (3, 6), under whose authority its Bureau, the FBI, had determined there had been no conspiracy] attesting to the fact that the file of JFK's autopsy photos was complete: "The X-rays and photographs described and listed above include all the X-rays and photographs taken by us during the autopsy, and we have no reason to believe that any other photographs or X-rays were made during the autopsy" (3, 7, 91). But, in another example of oscillation, members of the team also testified, both before and after signing the dubious document, that photographs they had taken during the autopsy are missing.

For example, three years before signing off that the file of autopsy photographs was complete, Dr. Humes had sworn to the Warren Commission that he had taken at least three images that aren't in the file: two or more images of JFK's skull and one or more of the interior of his chest. "This [skull] wound then had the characteristics of [a] wound of entrance from this direction through the two tables of the skull," Humes testified, "and, incidentally, photographs illustrating this ['coning' or 'beveling'] phenomenon [that show the bullet's direction] from both the external surface of the skull and from the internal surface were prepared" (86).

The complete inventory of autopsy photographs housed at the National Archives and examined by authors Wecht and Aguilar through special permission has no such images, nor have any such images ever been described in any official tally of the inventory. A simple oversight? One might be tempted to accept that explanation for the missing photos if the necessity of taking such photos were not so obvious and if Dr. Humes' recollection had not been independently corroborated by his teammates. One of them was Dr. Pierre Finck, a forensics expert from the Armed Forces Institute of Pathology, someone who would not have been insensitive to the forensic and legal importance of documenting the fatal wound for the expected trial of the then-living Oswald. He was firm that the photos in the inventory do not include the cranial images he shot.

During his formerly suppressed HSCA testimony (unearthed by the ARRB), Dr. Finck read from notes he had apparently written sometime closer to the time of the autopsy. "I help[ed] the Navy photographer to take photographs of the occipital wound (external and internal aspects) [sic]" (48). As



DR. BOSWELL EMPHASIZES THIS IS AN APPROXIMATION.

FIGURE C3. A, one of only two pages of original autopsy notes that survive from the night of JFK's autopsy. Two other sets of original autopsy notes were destroyed by JFK's chief prosecutor, Dr. James H. Humes, who explained that he destroyed the other notes because they were stained with splashes of JFK's blood. Note the splashes on this image; they are JFK's bloodstains. Note also the number "17" over the word "missing." Dr. Boswell swore that a 17-cm segment of JFK's skull and scalp was missing when he arrived for the postmortem examination. The final autopsy report, however, puts the dimension of the missing skull at 13-cm. B, diagram prepared by the ARRB's Douglas Horne based on the markings Dr. Boswell made on a model of a human skull to denote JFK's cranial injuries when viewed from above. When examined alongside Figure C3C, it is apparent that Dr. Boswell was depicting that JFK arrived with a massive cranial defect that is quite consistent with the drawing he made on the night of the autopsy, Figure C3A, but inconsistent with the "Rydberg" diagram prepared by the pathologists for the Warren Commission (Fig. C2). C, diagram prepared by the ARRB's Douglas Horne based on the markings Dr. Boswell made on a model of a human skull to denote JFK's cranial injuries when viewed from the side. When examined alongside Figure C3B, note that the cranial defect includes much of the right side of the parietal bone and a portion of the occipital and frontal bones.

with Dr. Humes, his obvious intent was to capture the telltale inward beveling at the point of in-shoot on JFK's cranium, a feature familiar to anyone who has ever shot a BB or a pellet through a pane of glass. Dr. Finck expanded on these notes under oath before the HSCA in 1977.

HSCA Counsel: "We have here a black-and-white blowup of that same spot [on the rear of JFK's scalp]. You previously mentioned that your attempt here was to photograph the...crater, I think was the word that you used."

Dr. Finck: "In the bone, not in the scalp, because to determine the direction of the projectile the bone is a very good source of information so I emphasize the photographs of the crater seen from the inside the skull. What you are showing me is soft tissue wound [sic] in the scalp."

A few moments later, the following exchange occurred: Dallas Chief Medical Examiner Charles S. Petty, MD: "If I understand you correctly, Dr. Finck, you wanted particularly to have a photograph made of the external aspect of the skull from the back to show that there was no cratering to the outside of the skull."

Dr. Finck: "Absolutely."

Dr. Petty: "Did you ever see such a photograph?"

Dr. Finck: "I don't think so and I brought with me memorandum referring to the examination of photographs in 1967...and as I can recall I never saw pictures of the outer aspect of the wound of entry in the back of the head and inner aspect in the skull in order to show a crater, although I was there asking [the photographer to take] these photographs. I don't remember seeing those photographs."

Dr. Petty: "All right. Let me ask you one other question. In order to expose that area where the wound was present in the bone, did you have to or did someone have to dissect the scalp off of the bone in order to show

this?"

Dr. Finck: "Yes. . . the scalp had to be separated from it in order to show in the back of the head the wound in the bone." (49)

There are no photographs of JFK's skull with the scalp reflected. But both JFK autopsy photographers backed up Drs. Finck and Humes. In 1997, Bethesda's chief autopsy photographer, John Stringer was asked, "Did you take any photographs of the head after scalp had been pulled down or reflected?" Mr. Stringer answered, "Yes" (12). Assistant medical photographer, Floyd Riebe, was asked, "Do you recall whether any pictures were taken from angles very close to the inside of the cranium?" "Yes," Mr. Riebe replied, "I think Mr. Stringer did that when the body was on its side" (13).

In 1964, Dr. Humes had also testified that, besides the cranial images, "Kodachrome photographs were made of this area in [the apical portion of] the interior of the president's chest" (81). Despite signing off on the completeness of the photo file in 1966, Dr. Humes told the HSCA the same thing in 1978 that he had told the Warren Commission in 1964. In a suppressed memo regarding a private interview, the HSCA reported that Dr. Humes, "specifically recall[ed] that Kodachrome photographs were taken of the president's chest" (50). In open testimony Dr. Humes told the HSCA, "I distinctly recall going to great lengths trying to get the interior upper portion of the right thorax illuminated. . . and what happened to that film I don't know" (46). Eighteen years later, Dr. Humes told the ARRB much the same thing: "We took one [picture] of the interior of the right side of the thorax. . . and I never saw it. It never—whether it was underexposed or overexposed or what happened to it, I don't know" (14).

Dr. Humes's fellow signatories independently recalled things the same way. The HSCA reported that Dr. Boswell had said that, "he thought they had photographed 'the exposed thoracic cavity and lung,' but doesn't remember ever seeing those photographs" (59). In 1996, Dr. Boswell was asked, "Are there any other photographs that you remember having been taken during the time of the autopsy that you don't see here?" "The only one that I have a faint memory of was the anterior of the right thorax," Dr. Boswell replied. "I don't see it, and haven't [sic] when we tried to find it on previous occasions, because that was very important because it did show the extrapleural blood clot and was very important to our positioning that wound" (15).

Similarly, John Stringer told both the HSCA and the ARRB that chest photographs were missing. The HSCA reported that, "Stringer remembers taking at least two exposures of the body cavity" (51). He testified to the ARRB that "There were some views that we—that were taken that were missing. . . I remember [photographing] some things inside the body that weren't there [in the file]" (16).

As with the photos of JFK's cranial wound, the importance of photographs of the apex of his chest should be emphasized. Besides the clinical value of such images, the autopsy team would not have been blind to the legal importance of docu-

menting the bruise at the apex of JFK's evacuated chest cavity for both the medical record and expected upcoming trial.

Whereas the significance of an incomplete photographic record of JFK's autopsy should not be understated, two related points bear emphasis. First, the contradictions between their attestation to the completeness of the file of photos in 1966 and their repeated testimonies before and after that date that images are missing does not speak well for the reliability of Dr. Levy's primary sources. Second, it shows, yet again, that Dr. Levy has overlooked important new evidence. Dr. Levy, however, does not ignore JFK's autopsy photographs entirely. He endorses them, using "evidence" that suggests he may be unfamiliar with yet another, recent official discovery.

Dr. Levy wrote, "The HSCA verified that the postmortem photographs and x-rays in the custody of the National Archives [which show the backside of JFK's head was undamaged] were authentic. Authentication of the autopsy photographs was essential because of the discrepant descriptions given of the wounds by eyewitnesses at Parkland Memorial Hospital, the doctors present at the autopsy, the Warren Report, and the Clark Panel" (65).

Indeed, the HSCA said it *had* authenticated the photographs (43). The images support Dr. Levy's view the discrepant Dallas doctors were wrong about the gaping hole in the back of JFK's skull thought by some to be an exit wound. But by the same token, the crystal clear photos also apparently prove that Dr. Grossman was wrong when he described a one inch-wide entrance wound in the middle of JFK's occipital bone. Dr. Levy seems not to appreciate his and his coauthor's predicament. He also seems to be unaware of what the ARRB discovered about the HSCA's process of authentication.

The story begins in an inconspicuous footnote that qualified the HSCA's public claim that from "microscopic" and "stereoscopic" examinations of the photos its experts had confidently concluded that the images were authentic (52, 53). The footnote only offered the minor caution that the HSCA had encountered a negligible glitch during authentication.

It wrote:

Because the Department of Defense was unable to locate the camera and lens that were used to take these [autopsy] photographs, the [photographic] panel was unable to engage in an analysis similar to the one undertaken with the Oswald backyard pictures that was designed to determine whether a particular camera in issue had been used to take the photographs that were the subject of inquiry. (54)

Regarding that very sentence, ARRB investigator, Mr. Douglas Horne, wrote, "By late 1997, enough related documents had been located and assembled by the authors to bring into serious doubt the accuracy of the HSCA's conclusion that 'the Department of Defense was unable to locate the camera and lens'. . ." (22). Mr. Horne reported that the Navy had sent the HSCA a fact sheet that "strongly reiterates the Navy's position that the camera provided to the HSCA was indeed the camera used at the autopsy on President Kennedy." The proof was a suppressed letter to the HSCA from the Assistant

Secretary of Defense indicating that the Department of Defense had indeed located, and had in fact already sent to the HSCA, “the only [camera] in use at the National Naval Medical Center in 1963” (22). However the HSCA wasn’t satisfied with the camera the Defense Department had fetched. In a letter asking the Secretary of Defense to look around for another one, HSCA chief counsel, Robert Blakey, explained the problem:

[O]ur photographic experts have determined that this camera, or at least the particular lens and shutter attached to it, could not have been used to take [JFK’s] autopsy pictures. (22)

Whereas the HSCA reported it could not completely close the loop because the camera was missing, the suppressed record suggests that 1) the loop was closed, 2) the camera was located, and 3) that the HSCA’s own experts determined the camera “could not have been used to take [JFK’s] autopsy pictures.” The HSCA staff elected to withhold this inconvenient information from the public. They also kept it from their own experts on the FPP, including the chairman, Dr. Micheal Baden (personal communication), and one of the authors of this essay [CHW]. And so, as Dr. Levy makes clear, the FPP experts were left to labor under the illusion that the images had passed authentication with flying colors.

Dr. Levy thus offers readers outdated and misleading government assurances while ignoring recent government discoveries that undermine those assurances. In doing so, he both boosts the government’s case for a single gunman at the same time he impugns Dallas doctors who described a rearward cranial wound, including, ironically, his co-author Dr. Grossman. The pristine backside of JFK’s scalp is crystal clear in the images except for a tiny wound or spot of blood at the top of JFK’s cranium overlying the right posterior parietal bone. Dr. Grossman has consistently maintained that the higher wound in the photos is not the larger occipital wound he saw.

So the images seem to prove that all the Dallas doctors who described rearward cranial damage were wrong. But also proven wrong, as we will show, are many of the autopsy witnesses who agreed with them. The images thus put Dr. Grossman in much the same position as his Dallas associates, and in the same position as the FBI agents who witnessed JFK’s autopsy, Francis O’Neill and James Sibert. For, like Dr. Grossman, Special Agents O’Neill and Sibert told the ARRB there was a rearward cranial wound where none appears in the images:

ARRB Counsel Gunn: “I’d like to ask you whether that photograph resembles what you saw from the back of the head at the time of the autopsy?” (*Fig. C4*)

Special Agent Francis O’Neill: “This looks like it’s been doctored in some way (25) . . . I specifically do not recall those—I mean, being that clean or that fixed up. To me, it looks like these pictures have been. . . It would appear to me that there was a—more of a massive wound. . .” (26)

Mr. Gunn also asked the other FBI witness who was present, Special Agent James Sibert, a similar question:

Counsel Gunn: “Mr. Sibert, does that photograph correspond to your recollection of the back of President Kennedy’s head?”

Special Agent James Sibert: “Well, I don’t have a recollection of it being that intact. . . I don’t remember seeing anything that was like this photo. . . I don’t recall anything like this at all during the autopsy. There was much—well, the wound was more pronounced. And it looks like it could have been reconstructed or something, as compared with what my recollection was. . .” (28)

Ironically, in an ARRB interview not mentioned by Dr. Levy, his coauthor Dr. Grossman reacted in almost exactly the same way. The ARRB reported:

When shown the Ida Dox drawing of the back of the head autopsy image [*Fig. C4*], Dr. Grossman immediately opined, “that’s completely incorrect” . . . The entry wound he saw was larger than the small entry wound depicted in the Ida Dox drawing, and lower on the head, well down in the occipital region, near the external occipital protuberance. In fact, Dr. Grossman’s opinion was that the entrance wound he observed on the rear of the skull had passed through the tentorium and the right cerebellum, and he remembered seeing what he believed to be cerebellar tissue through this punched out wound which he interpreted to be one of entrance. (17)

As Dr. Levy points out, Dr. Grossman now bows to the photographs and concedes that he must have been wrong about cerebellum; that, in other words, evidence from the photographic record of the autopsy, which has problems he was unaware of, trumps his own memory and those of his Dallas colleagues.

Thus, perhaps Dr. Levy regards dissecting the conflicts between Dallas and the autopsy photos as less helpful in understanding the true nature of JFK’s injuries than in determining whom to trust—the Dallas witnesses or the witnesses in the morgue. Given the clear advantages of those who witnessed the prolonged post mortem, it is not unreasonable to credit the Bethesda accounts over the discrepant doctors of Dallas. Moreover, the HSCA reported that the autopsy witnesses had uniformly endorsed Kennedy’s autopsy photos, and so all the more reason to reject Parkland. Or so it was once believed. But, as with the “complete” file of autopsy photographs and the HSCA’s authentication claims, records to which Dr. Levy makes no allusion have proven the converse.

In referring to the compilation of witness statements that one of the authors prepared (Aguilar), Dr. Levy seems to believe that the autopsy photographs rebut Dallas witnesses regarding JFK’s head wounds and prove those at Bethesda. That is not the case. Nor is that really even the controversy. In fact, both Dallas and Bethesda were in virtually complete agreement that Kennedy had a gaping rearward wound that involved his occiput. Thus, the real controversy is that the

images apparently disprove *both* Bethesda and the Dallas while also disproving Dr. Grossman's claims. But Dr. Levy's confusion may be the result of his greater familiarity with the "old" official evidence rather than the "new" official evidence.

In 1979 the HSCA did not mince words in resolving the apparent Bethesda/Dallas conflict. It wrote: "Critics of the Warren Commission's medical evidence findings have found [sic] on the observations recorded by the Parkland Hospital doctors. They believe it is unlikely that trained medical personnel could be so consistently in error regarding the nature of



FIGURE C4. Artist Ida Dox's rendition of the back of JFK's head based on an original autopsy photograph. This HSCA image is a virtually perfect rendition of the original autopsy photograph except for the small scalp wound to the right of the top of the ruler. In the original image, the wound is much smaller and less convincing as an entrance wound. [HSCA vol 7:104. On-line at: http://history-matters.com/archive/jfk/hasca/reportools/vol7/html/HSCA_Vol7_0057b.htm. Accessed 10/29/04.] The ARRB reported: "When shown the Ida Dox drawing of the back of the head autopsy image, Dr. Grossman immediately opined, 'that's completely incorrect' . . . The entry wound he saw was larger than the small entry wound depicted in the Ida Dox drawing, and lower on the head, well down in the occipital region, near the external occipital protuberance." There were other witnesses besides Dr. Grossman who disputed this image. The HSCA inaccurately reported that witnesses present at the autopsy uniformly agreed with the wounds depicted in this autopsy image.

[JFK's cranial] wound, even though their recollections were not based on careful examinations of the wounds. . ." (55). However, it continued, "In disagreement with the observations of the Parkland doctors are the 26 people present at the autopsy. All of those interviewed who attended the autopsy corroborated the general location of the wounds as depicted in the photographs; none had differing accounts . . . it appears more probable that the observations of the Parkland doctors are incorrect" (56).

This was a devastating rebuke to skeptics who had cited the Dallas doctors in arguing for a different wound, a different bullet trajectory, and perhaps even a different assassin than Oswald. But the proof—the autopsy witnesses' interviews—was entirely and unjustifiably suppressed. Had it not been for the ARRB's interest in this area, these interviews might have remained state secrets until 2028, the mandatory declassification date. A surprise lay in wait when they were prematurely unsealed in the mid-1990s.

While more than twenty Parkland witnesses said that at least part of JFK's cranial defect was rearward, it turns out that, despite the HSCA's claim to the contrary, just as many autopsy witnesses reported the same thing, whether in the suppressed HSCA interviews or in public Warren Commission documents and interviews (4).

For example, after interviewing the commanding officer of the military district of Washington, D.C., Philip C. Wehle, the HSCA's suppressed record says that, "[Wehle] noted that the wound was in the back of the head so he would not see it because the President was lying face up . . ." (57). (Autopsy images show a gaping wound on the right side of Kennedy's head in front of his right ear, where it should have been easy to see with JFK lying face up.) A Ph.D. candidate in pathology in 1963, James C. Jenkins, worked as a lab technologist in JFK's morgue. The HSCA said that Mr. Jenkins reported, "he saw a head wound in the ' . . . middle temporal region back to the occipital'" (58). The HSCA also said that another lab technologist, Jan Gail Rudnicki, had reported that the "back-right quadrant of the head was missing" (60).

Several of the autopsy witnesses, including two FBI agents, prepared diagrams for the HSCA that depicted a cranial defect involving JFK's occiput (4) (Figs. C5 and C6). These inconvenient diagrams, their accompanying interviews and similar statements by other autopsy witnesses were all suppressed.

And the discrepancy with Dallas? Compare these morgue accounts with that of Parkland's Robert McClelland, M.D. "The right posterior portion of the skull had been extremely blasted," he told the Warren Commission, "the occipital bone being fractured in its lateral half" (84). Or Charles J. Carrico, M.D., who told the Warren Commission that JFK's cranial defect was "in the posterior skull, the occipital region" (85). Virtually all the Dallas doctors and nurses offered similar descriptions. In Dr. Levy's article, his coauthor dealt with this by dismissing his Parkland colleagues on grounds of imprecision.

"Many doctors," Dr. Grossman explained, "loosely use the term [occipital] to refer to the 'back fifth of the head'" (65). It

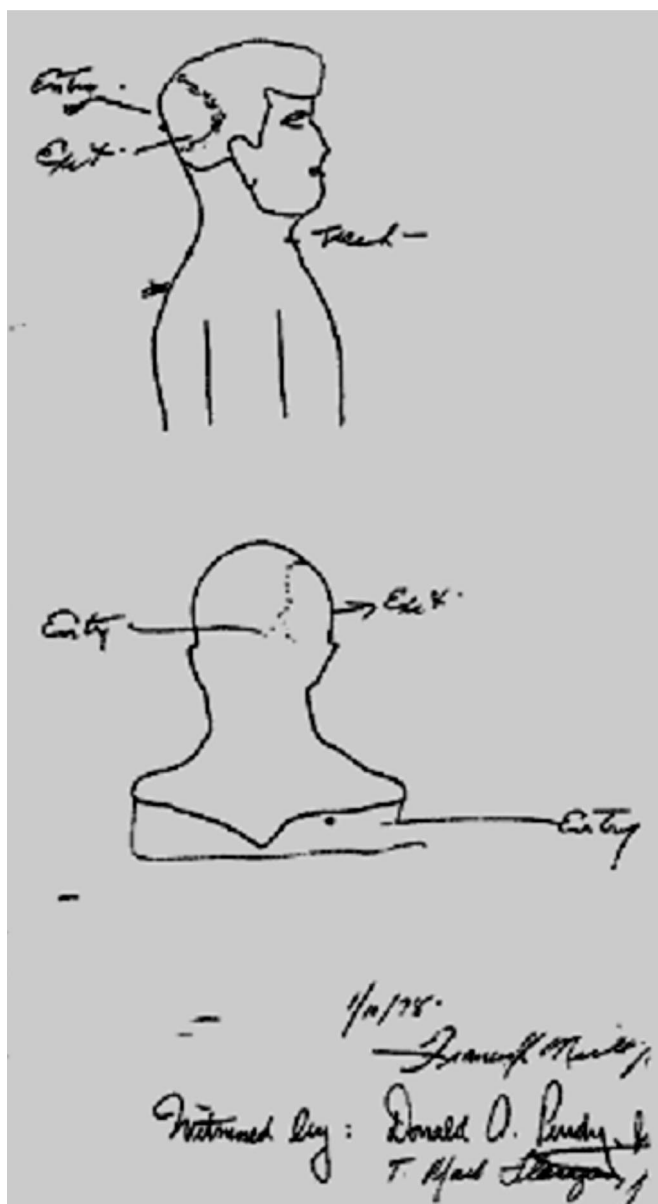


FIGURE C5. FBI Special Agent Francis O'Neill, an autopsy witness, prepared this diagram during testimony he gave to the House Select Committee in the late 1970s. Agent O'Neill's diagram shows the right rearward portion of JFK's cranium to be missing. The House Select Committee reported that all the autopsy witnesses agreed with location of the wounds as depicted in autopsy photographs that show no damage to the backside of Kennedy's cranium (Fig. C4). This image and others like it were suppressed until the mid 1990s when it was released after the passage of the JFK Act that led to the creation of the ARRB. [ARRB Medical Document #86. On-line at: http://history-matters.com/archive/jfk/arrb/master_med_set/md86/html/md86_0011a.htm. Accessed 10/29/04.]

is difficult to understand how even non-neurosurgeons would have referred to the gaping wound the photos show in front of JFK's ear as "occipital," as in, the "back fifth of the head." But

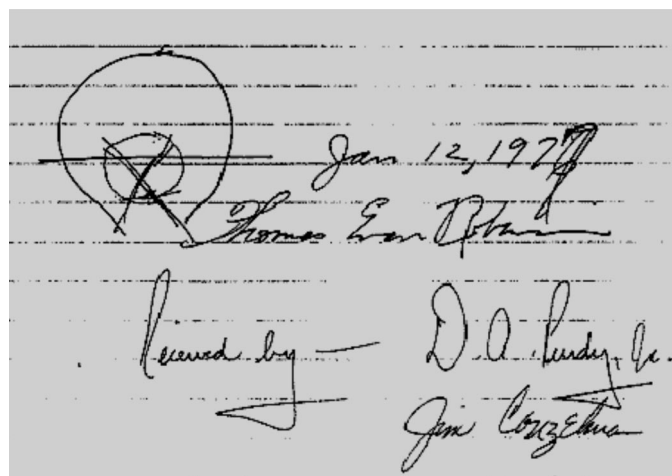


FIGURE C6. Prepared during testimony before the HSCA, this diagram showing a defect over the occiput of JFK's skull was prepared by the mortician who prepared JFK for burial, Tom Robinson. As with the image of FBI Special Agent O'Neill (Fig. C5), this image was suppressed until the mid 1990s. [ARRB Medical Document #63. On-line at: http://history-matters.com/archive/jfk/arrb/master_med_set/md63/html/Image13.htm. Accessed 10/29/04.]

what of perhaps the best witness in Dallas—Parkland's chairman of neurosurgery, Kemp Clark, M.D., the senior treating physician at Parkland, the man who signed JFK's death certificate, and Dr. Grossman's superior on the day of the assassination?

The ARRB asked Dr. Grossman about Dr. Clark in 1997. "Repeatedly during the interview," the ARRB reported, "Dr. Grossman suggested that we interview Dr. Kemp Clark, and said that he felt Dr. Clark's observations would be more accurate than his, since Dr. Clark had much more experience at that time than he with gunshot wounds to the head and neurosurgery in general" (18).

Unacknowledged in Dr. Levy's report, which accurately reflects Dr. Clark's descriptions of JFK's cranial injuries in official documents, is the fact that Dr. Grossman's superior was just as "loose" with the term "occiput" as were the discrepant Dallas doctors he dismissed. For example, on the day of the assassination, Dr. Clark wrote, "There was a large wound beginning in the right occiput extending into the parietal region" (87). Under oath before the Warren Commission, Dr. Clark further explained that, "This was a large, gaping wound in the right posterior part, with cerebral and cerebellar tissue being damaged and exposed" (88). Whose description are we to accept?

There is abundant scientific support for the commonsense notion that descriptions given immediately after an event are more likely to be accurate than accounts given years later (37, 67–70). There is even evidence that the human mind is capable of creating false memories (67). Given that Dr. Clark recorded his impressions immediately and testified under oath close to the time of the events, whereas Dr. Grossman waited 18 years

to give his account to a newspaper reporter, and given that even Dr. Grossman has said that Dr. Clark's then-greater experience with such wounds confers greater authority to his account, one would have hoped Dr. Levy would have offered better reasons than he has to accept Dr. Grossman's description and reject the near identical descriptions of Dr. Clark and his Parkland colleagues (*Fig. C7*).

And if Dr. Levy is going to continue to regard JFK's autopsy photographs as unassailable, he might usefully offer a sensible explanation for 1) why his coauthor and two FBI agents apparently rejected them, 2) why the photos failed a test designed to link them to the autopsy camera, 3) why the autopsy team testified that some images have vanished, 4) why myriad witnesses at both Parkland and the morgue made the same mistake in claiming that Kennedy had a gaping rearward skull wound that is remarkable by its absence in the pictures, and 5) why not a single witness described what is visible in the photographs.

Unfortunately, the contradictions in the autopsy evidence do not end here. For while the photographs of Kennedy's brain seem to be a reasonable match for its measured weight and autopsy description, the images are contradicted by several witness reports from both Parkland and Bethesda, as well as by evidence from the scene of the shooting.

Dr. Levy used Dr. John Lattimer's claim that 70% of JFK's right cerebral hemisphere was missing as a springboard to succinctly dispatch another important, photography-related controversy: "We should note that some authors have used the term 'missing' when referring to the brain which has led to extreme theories of the nature of the injuries," he wrote. However, he added, the "drawing by Ida Dox (sic) demonstrates a bullet track in the right hemisphere extending from the occipital lobe forward, but the brain was not missing." There the discussion ended with the reader left to assume that the Dox sketch was accurate and that Dr. Lattimer was not.

Unfortunately, Dr. Levy shortchanged his readers by printing the wrong diagram—the HSCA's depiction of a blasted human skull, not the Ida Dox drawing of an autopsy photograph of JFK's brain—and by not mentioning the ARRB's contributions to the controversies involving JFK's brain, controversies that again pit the autopsy findings and photographs against credible witnesses.

But Dr. Lattimer's estimate was probably based on more than just this HSCA diagram, which faithfully renders photos that show a disruption of JFK's right cerebrum with little actual loss of mass (*Fig. C8*). He may have based it on the reports of several key witnesses. In the *Journal of the American Medical Association*, for example, Dr. Humes reported that, "two thirds of the right cerebrum had been blown away" (35). Dr. Boswell testified that one-half of the right cerebrum was missing (19). When shown the photographs of JFK's brain at autopsy, FBI Agent O'Neill told the ARRB in 1997, "The only section of the brain which is missing is this small section over here. To me, that's not consistent with the way I recall seeing it." Mr. O'Neill amplified, saying that when JFK's brain was removed, "more than half of the brain was missing" (24).

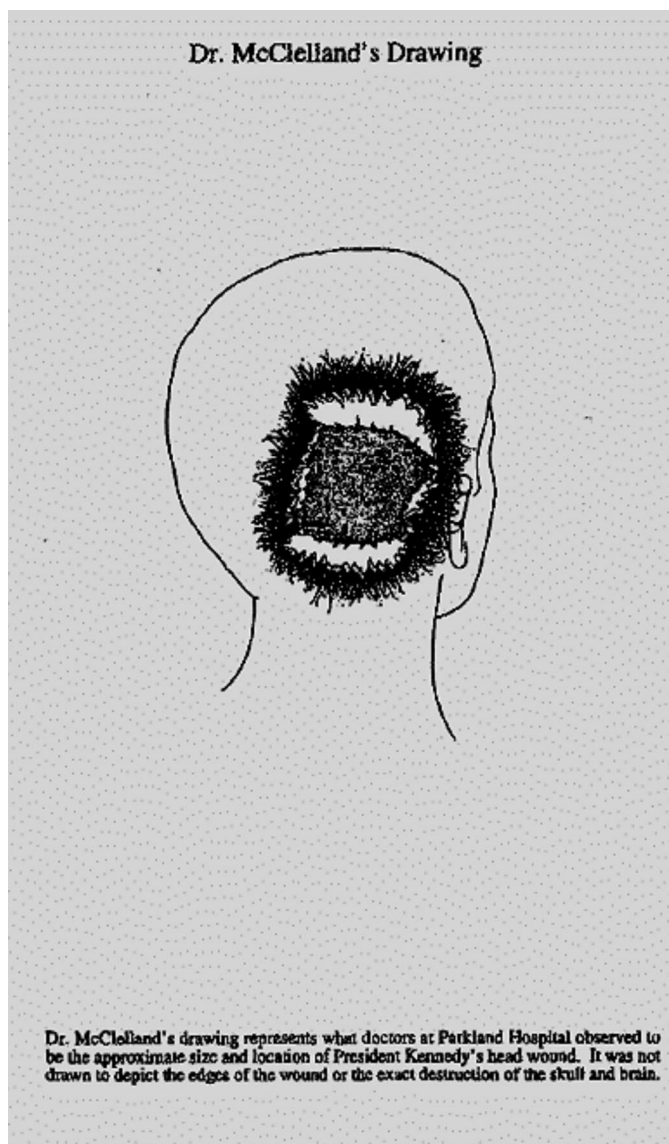


FIGURE C7. ARRB Medical Document #264. This diagram prepared under the direction of Parkland Hospital witness, Dr. Robert McClelland, in the mid 1960s depicts the rearward cranial injury that numerous witnesses at both Parkland Hospital and the Bethesda Naval Hospital morgue recalled having seen. [On-line at: http://history-matters.com/archive/jfk/arrb/master_med_set/md264/html/md264_0001.htm. Accessed 10/29/04.]

The assistant autopsy photographer, Mr. Floyd Riebe, recalled things much the same way. When asked by ARRB counsel, "Did you see the brain removed from President Kennedy?" Riebe answered, "What little bit there was left, yes. . . Well, it was less than half of a brain there" (29). Finally, the chief of anesthesia at Parkland Hospital, Marion Thomas Jenkins, M.D., reported that Jackie Kennedy had handed him "a large chunk of her husband's brain tissues" (36) during the resuscitation effort. The Zapruder film shows such a massive jetti-

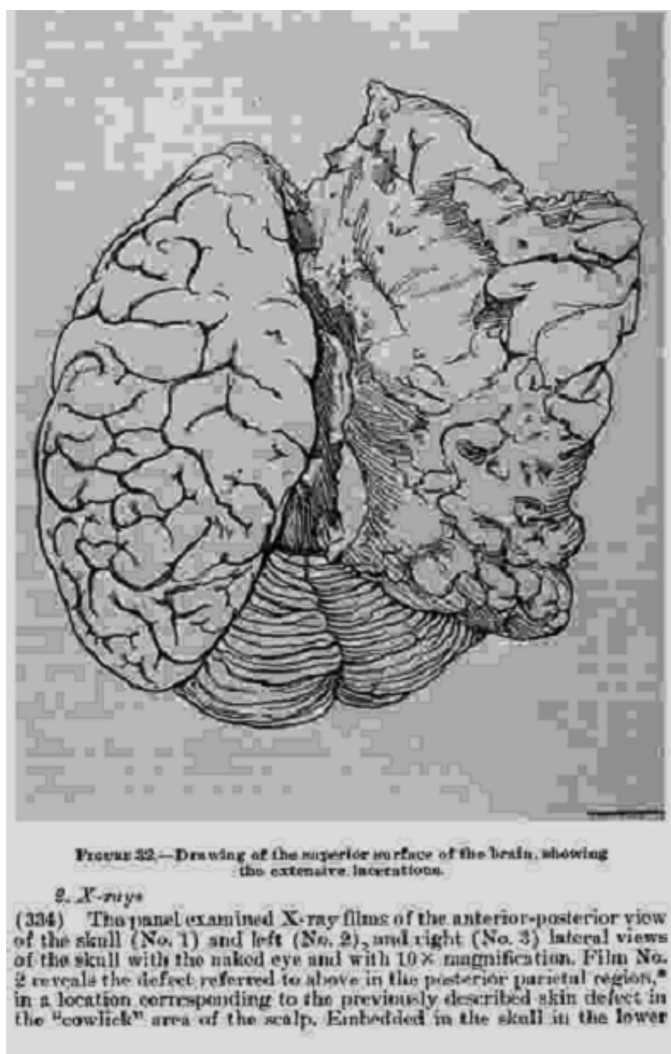


FIGURE C8. This is an HSCA-produced, accurate artistic rendering of an autopsy photograph of JFK's brain shot from above. The image shows that the right cerebrum was disrupted toward the right, but that little of "Kennedy's" brain is actually missing. The measured weight of JFK's brain was given at 1500-grams. The average weight of a complete, adult human brain is 1350-grams. Several autopsy witnesses rejected the brain photographs from which this image was traced, saying that much more of JFK's brain was missing than appears to be missing in this image. [On-line at: http://history-matters.com/archive/jfk/hasca/reporttools/vol7/html/HSCA_Vol7_0070b.htm. Accessed 10/29/04.]

soning of tissue from Kennedy's head that something like what these witnesses reported seems likely to be true.

Hence, the brain photographs contradict the prosecutors, other credible witnesses, and the Zapruder film. FBI Special Agent Francis O'Neill, who observed the autopsy, rejected the images commenting, quite rightly: "This looks almost like a complete brain" (27).

In rejecting the images, O'Neill was joined by the photographer of record, John Stringer. Stringer claimed that he took images of sections of the brain, which are missing, and that the images in the current file were not taken with the type of camera or type of film he used at that time (20).

If Dr. Levy is right to accept the pictures and the brain weight, then what is exploding from JFK's skull when his head erupts in the Zapruder film? What ejecta caused the "jet effect" that Dr. Levy proposes may have propelled JFK's head rearward? Officially, virtually nothing, it seems. As intractable as this conflict might seem, an intriguing possible solution was first publicized in a *Washington Post* article.

The November 10, 1998, news headline read: "Archive photos not of JFK's brain, concludes aide to review board; staff member contends two different specimens were examined" (23). The *Washington Post* report was the first public acknowledgment of an ARRB memo advancing the so-called "two brain" hypothesis of former naval officer and review board staffer, Douglas Horne. After carefully comparing accounts of the appearance of JFK's brain on the night of the autopsy against photographs disavowed by the photographer which contradicted these accounts, and after comparing incompatible accounts of the timing of the brain examination given by the prosecutors and lab personnel, Mr. Horne concluded that two different brains were examined on two different days (22).

If Horne is right, the HSCA diagram likely depicts the second brain that was examined, the one that weighed 1500 grams. But this is not the brain that we see exploding in the Zapruder film, not the one missing the "large chunk" Mrs. Kennedy handed Dr. Jenkins. Nor is it the one that Dr. Humes, Dr. Boswell, Agent O'Neill, or the photographer, Reibe, said was missing so much mass. In fact, no witness has ever described seeing a JFK brain that looks like the one in the autopsy photographs.

Dr. Levy may have his reasons for rejecting Horne's hypothesis. But because he sets such stock by official sources and analyses, one wishes he had at least acknowledged this intriguing government report, or the coverage of it in the *Washington Post*, if only for the purpose of refuting it.

Although Dr. Levy rightly acknowledges that unsolved mysteries still abound, he nevertheless fails in his pledge to "present that which is currently known regarding the nature of the wounds." He fails to explore new data about several important matters related to understanding Kennedy's injuries. These data raise additional doubts concerning the performance of the autopsy, and hence the conclusions of the autopsy report. In addition, they raise questions about the credibility of the official investigations that reexamined JFK's autopsy findings.

For example, Dr. Levy acknowledges that the prosecutors did not dissect JFK's back wound. However, he fails to explore this inexplicable failure. Seen as an oversight, it is all the more baffling because the prosecutors completely disemboweled the President's uninjured abdomen in search of evidence they had no reason to suppose they would find in that location while

leaving undisturbed a wound with great evidentiary potential. So why *didn't* they dissect JFK's back wound?

A possible explanation may have come during the testimony of Dr. Pierre Finck. During the trial of Clay Shaw in New Orleans in the late 1960s, Dr. Finck was asked under oath why he had not dissected JFK's back wound:

Dr. Finck: "As I recall I was told not to, but I don't remember by whom."

Counsel: "You were told not to but you don't remember by whom?"

Dr. Finck: "Right."

Counsel: "Could it have been one of the Admirals or one of the Generals in the room?"

Dr. Finck: "I don't recall" (38).

Apparently, this decision was not made by the autopsy team, a fact corroborated by Dr. Humes in an interview with author John Lattimer, M.D. "[Commander Humes' and Boswell's] request for permission to dissect out this bullet hole, which led into the upper back and possibly into the neck, was denied," Dr. Lattimer reported (63).

But that key failing was scarcely the full extent of the prosecutors' fumbles. "Where bungled autopsies are concerned, President Kennedy's is the exemplar," said Dr. Michael Baden, the chairman of the HSCA's Forensic Pathology Panel (32).

The HSCA's criticisms included the fact that JFK's wounds were not properly dissected or properly described relative to standard anatomic landmarks. The pathologists did not examine JFK's clothes. The angles of the bullet tracks through the body were not measured relative to the body axis. The brain was not properly examined. Original autopsy notes were destroyed. Proper autopsy photographs were not taken, etc. (61).

Dr. Charles Wilbur, the former Deputy Coroner of Larimer County, Colorado and a Fellow of the American Academy of Forensic Sciences, offered a possible explanation. "The deficiencies in the autopsy. . . were so extensive as to preclude the effects of crisis, emotion, bewilderment, or confusion as explanations. . . Human error may explain some of the deficiencies. To explain them all demands willful actions on the parts of persons in unique seats of authority and power" (93).

An obvious trail of bullet fragments is visible along the very top of JFK's head in the lateral cranial x-rays, just inside the parietal bone (Fig. C9). As Dr. Levy correctly notes, the autopsy report places that trail much lower and perfectly aligned with the low entrance specified by the prosecutors. "[There are] multiple minute metallic fragments along a line corresponding with the line joining the above described small occipital wound and the right supra-orbital ridge," says the autopsy report (89).

The radiologist for the Clark Panel, a group that preferred a 10-cm higher in-shoot, reported the fragment trail aligns perfectly with that higher position, well above lambda in parietal bone (31). It was not until HSCA consultant, David O. Davis, M.D., described it that the trail's true location received official recognition—a full 5-cm higher than Clark had it and 15-cm higher than the pathologists reported. (After inspection of the original x-rays at the National Archives, both Drs. Wecht and



FIGURE 20.—Photograph of a computer-assisted image enhancement of a lateral X-ray of the skull (autopsy X-ray No. 2).

FIGURE C9. This enhanced image of JFK's lateral x-ray was prepared and published by the HSCA. Note that among the numerous tiny opaque bullet fragments that are visible in this image, a near-horizontal "trail" of fragments can easily be seen just inside the uppermost portion of parietal bone. [HSCA vol 7:112. On-line at: http://history-matters.com/archive/jfk/hasca/reportvols/vol7/html/HSCA_Vol7_0061b.htm. Accessed 10/29/04.] The autopsy report described this trail as aligned with the entrance wound in occipital bone, just above the external occipital protuberance and 15-cm lower than it appears in this x-ray. The Clark Panelists described this trail as approximately 10-cm higher than specified in the autopsy report, aligned with the higher location they had selected as the entrance wound, yet 5-cm lower than it appears in this x-ray.

Aguilar affirm the accuracy of Dr. Davis's high placement of this quite obvious trail of fragments [Fig. C9].

The point is scarcely trivial; the trail tended to vary in location to conform more with the preferred trajectories of some "expert" investigators than where it actually was. The real location of the trail offers no dispositive proof of any of the proposed trajectories for a shot from behind, including Dr. Grossman's.

Dr. Levy cited contradictory claims about a valuable forensics clue—the visible, and very obvious, abrasion collar seen in

pictures at the lower edge of the bullet hole in JFK's back. A bullet that strikes perfectly perpendicularly leaves a circular abrasion collar, a sort of bruise, at the edges of the skin around the bullet hole. JFK's abrasion collar is greatest toward the bottom of his back wound. This suggests the bullet was moving upward when it hit, leaving a larger bruise where it first struck and stretched JFK's skin.

Dr. Levy offers no explanation for how a bullet from above could produce an abrasion collar at the bottom of the wound. Nor does he acknowledge that the Clark Panel, which so wanted evidence for a shot from above, misdescribed the bruise as "most pronounced on its upper and outer margins" (30). He failed, in other words, to address the implications of Rockefeller Commission consultant Werner Spitz, M.D., who wrote that, "There is no doubt that the bullet which struck the President's back penetrated the skin in a sharply upward direction, as is evident from the width of the abrasion at the lower half of the bullet wound of entrance. The term 'sharply upward direction' (sic) is used because it is evident from this injury that the missile traveled upwards within the body" (73).

Dr. Levy purports to "present that which is currently known regarding the nature of the wounds sustained by President Kennedy" and "to attempt to provide a resolution of the controversies." But although he acknowledges the ARRB, he has presented none of the important new facts and interpretations from the ARRB that have so greatly expanded our understanding. Instead, he has recycled many outdated and dubious government assertions while overlooking abundant new ARRB evidence that, ironically, disproves many of them.

It is this new evidence that truly represents what is "currently known." By overlooking it, he is constrained to provide only what is left: evidence from the government's campaign to promote a no-conspiracy verdict in the Crime of the Century. Alas, that 40-year struggle has repeatedly hamstrung efforts to achieve clarity regarding the true facts of John F. Kennedy's injuries. And without dependable facts, and there are very few that are, any conclusions about the number of shots or the number and location of shooters will remain purely speculative.

Declassified files have demonstrated that even some of the government's most frequently repeated facts or solemn assurances about the JFK case have failed to withstand scrutiny. JFK's "authenticated" autopsy photographs are a prime example. Dr. Levy's good faith repetition of dubious official claims that the photos had been authenticated might have been avoided had he been familiar with new evidence that the images not only failed a key authentication test but that they were rejected by credible witnesses, including his co-author, Dr. Grossman, in an ARRB interview.

At first blush, Dr. Levy's approach to finally resolving the controversies about JFK's head injuries by invoking the eyewitness account of an accomplished neurosurgeon seems entirely reasonable. But he hasn't succeeded. He provides no compelling reason to prefer the description of one physician who waited 18 years to give it over the good faith descriptions of a more experienced neurosurgeon and numerous other

credible physicians who immediately wrote down what they saw. Nor does his co-author/witness help settle the hot controversies swirling around JFK's autopsy photos. On the contrary, if anything, Dr. Grossman's contradictory reports have only added fuel to the fire.

Given the pro-government position of Dr. Levy's report, there is no small irony in the fact that when Dr. Grossman, a civilian, scoffed at JFK's autopsy photographs during an interview with the ARRB, he became the eighth person to join a distinguished roster of credible government witnesses who had also raised questions about them. That includes the two FBI agents who were present during the autopsy, both Navy autopsy photographers, and all three of JFK's military pathologists.

Furthermore, in light of the declassified record of the government's mishandling of data related to JFK's injuries, and its record of misleading reporting, the scope of unchallenged, pro-government assurances that remain for Dr. Levy to offer his readers has narrowed considerably. The demonstrable carelessness of previous government investigators is what poses perhaps the greatest obstacle to achieving a clear understanding of the true facts in this frustrating case. Put another way, few, if any, of the primary and secondary sources that Dr. Levy has used—the sorts of primary and secondary sources that one would normally use—can be taken on faith in the Kennedy case.

Dr. Levy and his coauthors are to be congratulated for bringing long overdue attention to the important and fascinating subject of President Kennedy's injuries. Unfortunately, much of the information they present has been rendered obsolete by new information during the past 10 years, and yet the job is still incomplete. Much additional work and responsible reporting remains to be done if we are ever to achieve a satisfactory understanding of JFK's injuries and the implications they entail. [Ptr: Refs (23, 40, 66, 82, and 83 are not cited in the text; they are cited here for parsing.

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DOI: 10.1227/01.NEU.0000181083.23161.87

Systematic Review of Ablative Neurosurgical Techniques for the Treatment of Trigeminal Neuralgia

To the Editor:

The authors present a literature review (2) to evaluate the effect of major destructive procedures (radiofrequency thermocoagulation [RFT], glycerol rhizolysis [GR], balloon micro-compression [BC], stereotactic radiosurgery [SRS]) for the trigeminal neuralgia. Above all, we should mention that the use of the term “destructive” rather than “ablative” would be more appropriate. This is because “ablative” means “removing the tissue from its original location;” however, “destruction,” means “devastating the tissue in concern.” In these kinds of procedures, it is “destruction” that is performed, not “ablation” (5).

It should be considered that not all “destructive” methods belong to the same category. For example, RFT has been defined as “controlled destructive intervention” by many authors. Because RFT is conducted in cooperation with the patient under neuroleptic anesthesia, it provides an important strategic advantage. At one time, RFT was considered effective only on A Delta and C fibers, and was therefore the most efficient method. Later on, however, histopathological studies showed that not only were A Delta and C fibers affected by RFT (1, 3, 4), but other fibers as well. A Delta and C fibers are more sensitive to heat inflicted lesions. We can detect this sensitivity only through controlled interventions and inflicted lesions. SRS is advantageous with respect to formation of lesions of various calibrations. However, the calibration with which the most effective response is obtained remains controversial. In GR, on the other hand, we do not have the chance of controlled lesion formation.

Lopez et al. have performed an elaborate and objective study on the treatment of a condition that has been debated. We believe that those with questions have been enlightened as to the positive and negative aspects of the procedures. Nevertheless, the cost effectiveness of the treatment procedures could have been briefly evaluated, as the cost is undeniably important in relation to the economic conditions of the world today. Unfortunately, cost-effective and efficient treatment procedures are less promoted than expensive ones. Thus, cost per patient is disregarded in general reviews, which we think constitutes a matter of concern. Furthermore, the long-term efficiency of the expensive procedures with limited numbers of patients and short follow-up periods is questionable. If in fact these expensive procedures, when used in long-term stud-

ies, are significantly more successful and have fewer complications than cheaper procedures, they can be recommended as treatment alternatives. The studies with no 28- and 39-, with 22- and 26-month follow-ups have been presented with 3-year actuarial rates of complete pain relief, which may suggest a conflict. Despite all these, we leave the statement of “SRS is a clear winner” in one of the commentaries to the discretion of the audience.

What do we gather from the statement “after the application of the procedure, the patient’s pain resolved?” In our opinions, success rate is the pain-free period without medication. It is certain that the expression of “partly” creates subjectivity. Therefore, the evaluation of the success rate in pain therapy should be based on long-term follow-up, and optimistic interpretations should be avoided. Unfortunately, it is often the opposite.

While determining the appropriate therapy, the length of time a patient could be followed with each modality should also be considered. In pain therapy, our 30 years of experience has taught us not to classify any one method as initially good or bad. For example, in our experience, it is too early to determine the role of SRS in trigeminal neuralgia treatment. It is costly and the comments are subjective. Microvascular decompression yields the best results in young virgin patients. Its implications for recurrent cases are debatable and it has presented poor results in failed trigeminal neuralgia. In RFT, lesions can be inflicted under control and the procedure can be repeated, which is an important advantage. When needed, the number of lesions and hypoesthesia can be increased. We, as scientists, should learn objective questioning of the reliability of information rather than dogmatic approaches and similar studies that could enlighten the public are of utmost importance. Let us not forget that we live in century of science and technology, but also an age of companies ruling science and technology. Thus, the texts of this kind will help direct our therapy strategies.

Whatever treatment procedure may be applied, it is obvious from the success rates of all procedures used that unfortunately some trigeminal neuralgia patients continue to suffer from pain. With regard to this review, we believe there is a need to start discussion on an issue of “failed trigeminal neuralgia” for the patients still suffering from pain despite the long-term follow-up and application of many procedures. Moreover, there remains a need for suggestions toward solutions. What should be the algorithm of failed trigeminal neuralgia? We would like to share our background knowledge and thoughts with you in another piece of writing and receive your ideas.

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DOI: 10.1227/01.NEU.0000181084.00290.7A

Routine Cerebral Angiography after Surgery for Saccular Aneurysms: Is It Worth It?

To the Editor:

I found the article by Kivisaari et al. on postoperative angiography for aneurysm surgery fascinating and well written (2). These very experienced surgeons reported findings of postoperative angiography on 493 ruptured and 315 unruptured aneurysms. Complete aneurysm obliteration occurred in 88% of cases. There was a neck remnant in 9%, fundus still filling in 3% and a major arterial occlusion in 5%. The results are not out of line with what we reported previously and with those reported by other cerebrovascular neurosurgeons (1, 3, 5). The arguments for and against conduct of angiography after aneurysm surgery are dealt with by the authors and I won't rehash them here. What I wanted to bring to attention was the author's comment that performing intraoperative angiography would be a good idea "if a simpler method were made available." I described quite a simple method applicable to many anterior circulation aneurysms (4). This was intraoperative angiography by catheterization and retrograde injection of the superficial temporal artery. This is not a new idea. The superficial temporal artery was one of the first arteries to be catheterized for arterial blood pressure monitoring and for conduct of diagnostic cerebral angiography (6, 7). Sean Mullan used this technique for years at the University of Chicago and I learned it from him when we used it to follow the progress of open packing of the cavernous sinus for carotid-cavernous fistulas. The main equipment required is a mobile fluoroscope and a radiolucent pin head holder. You actually don't even need the radiolucent head holder for routine proximal aneurysms of the circle of Willis since the head holder can be placed high enough that it doesn't interfere with fluoroscopy so all that is essential is the fluoroscope. This also determines the quality of the images which are excellent with the good modern machines. The limitations are those inherent in interpreting angiograms. Catheterizing the artery is usually straightforward, but can be extremely frustrating because the catheter is surprisingly prone to passing down the plane between the tunica media and adventitia as opposed to the lumen of the vessel. Because most anterior communicating artery aneurysms fill from one side and the contralateral pre-communicating segment of the anterior cerebral artery is small, a unilateral injection through the superficial temporal

artery can give all of the information needed. Some creativity also can be spawned by desperation; I have done intraoperative angiography for posterior circulation aneurysms by retrograde injection of the muscular branch of the vertebral artery.

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In Reply:

We are familiar with the method of catheterization of the superficial temporal artery. As mentioned in Dr. MacDonald's comment on our article (2), the catheterization of the superficial temporal artery can be very time-consuming and, thereby, also money-consuming, and it does not solve the problem of demanding interpretation of the angiographic images with the head tilted in the headframe.

As Helsinki is the only neurosurgical unit serving a population of 2 million in Southern Finland, we treat more than 300 unselected aneurysm cases yearly, including patients in poor condition or who are moribund. The large volume of patients does not allow time-consuming controls in the operating room. Effectiveness must not be at the expense of quality of patient care, of course, but in the world of limited resources fast, simple, and, if possible, cheap methods should be chosen.

Instead, the use of intraoperative indocyanine green angiography, introduced by Feindel et al. (1) and revived for aneurysm surgery by Raabe et al. (3), is a very elegant method in detecting of aneurysm rests and vessel occlusions. The method was recently shown also suitable for intraoperative confirmation of extracranial-intracranial bypass patency (4). For us it would appear to be one of the greatest developments in open microsurgery of cerebral aneurysms over the last few years. Combining this method with computed tomographic angiography will make catheterization studies obsolete in open microsurgery. Once this new method of intraoperative indocya-

nine green angiography is in general use it should be used in all aneurysms and by all of those who continue to treat cerebral aneurysms using open microsurgery.

Riku Kivisaari
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Mika Niemelä
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DOI: 10.1227/01.NEU.0000181085.07914.39

Anteroinferior Cerebellar Artery Aneurysms: Surgical Approaches and Outcomes—A Review of 34 Cases

To the Editor:

We read with great interest the excellent article by Gonzalez et al. (2) on Anteroinferior cerebellar artery (AICA) aneurysms. As we always are standing on the shoulders of pioneering giants, we feel that their techniques and their results, as “gold standards,” should be carefully reviewed. The huge never-to-be-repeated experience in surgery of 1767 vertebrobasilar artery aneurysms of Professors Drake and Peerless was not completely correctly cited in this article.

TABLE C1. Preoperative Grade (Botterell) and outcome in 57 patients with anteroinferior cerebellar artery aneurysms

Grade	Excellent	Good	Poor	Dead	Total
0	7	4			11
1	25	3	3	1	32
2	4	2		1	7
3	1	2	3		6
5				1	1
Total	37	11	6	3	57

TABLE C2. Aneurysm size and outcome in 57 patients with anteroinferior cerebellar artery aneurysms

Size	Excellent	Good	Poor	Dead	Total
Small	24	5	3		32
Large	7	3		3	13
Giant	6	3	3		12
Total	37	11	6	3	57

TABLE C3. Aneurysm site and outcome in 57 patients with anteroinferior cerebellar artery aneurysms

Site	Excellent	Good	Poor	Dead	Total
Basilar AICA	32	10	5	2	49
AICA proximal	2		1	1	4
AICA distal	3	1			4
Total	37	11	6	3	57

TABLE C4. Age (years) related to outcome in 57 patients with anteroinferior cerebellar artery aneurysms

Age group	Excellent	Good	Poor	Dead	Total
10-19	3				3
20-29	5	5	1		11
30-39	7	1			8
40-49	8	2	3	1	14
50-59	12	3	1		16
60-69	1		1	2	4
70 or more	1				1
TOTAL	37	11	6	3	57

We scrutinized once more the experience in London, Ontario on 57 patients AICA aneurysms (1957-1992) (1, 5), the largest single-center series, other than the large Phoenix experience, that might be useful for those attacking these deadly lesions of basilar artery (Tables C1-C6). These 57 (3.2%) cases are selected from collaborative database with Drs. Drake and Peerless on their surgery in 1767 patients with vertebrobasilar artery aneurysms (Chapter on Midbasilar Trunk Aneurysms, 44 patients; Chapter 10 on Basilar Anterior Inferior Cerebellar Artery Aneurysms, 41 patients; and on Chapter 11, Giant

TABLE C5. Operative method and outcome in 57 patients with anteroinferior cerebellar artery aneurysms

Operative method	Excellent	Good	Poor	Dead	Total
Clip	26	6	6	2	40
Silk ligature	1				1
Wrapping	2				2
Both vertebrals occluded	1				1
Basilar occlusion	2	3			5
Trapping	3				3
Endovascular				1	1
Excision	1	1			2
Exploration only	1	1			2
Total	37	11	6	3	57

TABLE C6. Operative method and result of aneurysm treatment in 57 patients with anteroinferior cerebellar artery aneurysms

Operative method	Total obliteration	Residual neck	Residual fundus	No obliteration	Total
Clip	35	3	2	2	40
Silk ligature	1				1
Wrapping				2	2
Both vertebrals occluded	1				1
Basilar occlusion	4		1		5
Trapping	3				3
Endovascular			1		1
Excision	2				2
Exploration only				2	2
Total	37	11	6	3	57

Basilar Trunk Aneurysms where 16 patients out of 59 surely had giant basilar AICA aneurysms). Our comment is further supported by the total experience of close to 400 vertebrobasilar aneurysms derived from an unselected patient material of 2463 patients with cerebral aneurysm treated in Eastern Finland (Kuopio) in the years 1977 to 2000 (3, 4), and from more than 2000 patients with cerebral aneurysms treated in Hel-

sinki, Finland in recent experience since 1997 (one-sixth of them vertebrobasilar). The frequency of AICA aneurysms in these 4500 Finnish patients with cerebral aneurysms without any referral biases is less than 0.5 % (22 patients), even with four vessel angiography and recent computed tomographic angiography, in which all the vessels are immediately seen.

The 57 AICA aneurysms can be classified as follows (1): 1) basilar AICA aneurysms (49 patients); 2) proximal AICA aneurysms (4 patients); and 3) distal AICA aneurysms (4 patients). These aneurysms arise in the crotch of the origin of AICA over the lower reaches of the middle third of the clivus, about 1 cm above the vertebrobasilar junction. In two patients, however, the aneurysm, however arose on the proximal side of this junction. They tend to project laterally, but one-fourth have been anteriorly against the clivus or even posteriorly to indent the pons (3 cases). There is always a close or intimate relationship to the sixth nerve. Six patients had an associated arteriovenous malformation (AVM): in two patients, the aneurysm arose from the basilar artery, once proximally and three times distally from AICA. In five instances the aneurysm was responsible for bleeding. Three additional proximal and one distal AICA aneurysm were seen. A preponderance of female patients (36) is peculiar for even these aneurysms. All except two of these 57 aneurysms were saccular. Two aneurysms were fusiform: an unruptured fusiform aneurysm in a 40 year-old-male was wrapped with acrylic, but a large bilobular basilar aneurysm at the origin of both AICAs in a 59 year old female could be treated with a combination of a long straight Sugita clip and Drake-Sugita clip. Mean age in these 57 patients was 42 years (range, 10–71 years). There were 32 small aneurysms (<12 mm), 9 aneurysms were large (13–24 mm) and 16 were giant (≥ 25 mm). Six patients had an associated AVM: in two patients, the aneurysm arose from the basilar artery, once proximally and three times distally from AICA. In five instances, the aneurysm was responsible for bleeding. Ten patients had multiple aneurysms (17 additional aneurysms, three of these additional aneurysms were proximal AICA aneurysms and one distal AICA aneurysm). There was no side predominance. Twelve aneurysms were unruptured. Five of the 16 giant aneurysms had mass effect only, with varying degrees of bulbar paresis and ataxia, often with mild hemiparesis, hemisensory loss, and limb dysmetria.

As might be expected, 6th nerve palsy was the most frequent (13 cases) preoperative cranial nerve dysfunction, and it was in three cases bilateral. In 10 of 16 patients, it was the only preoperative cranial nerve paresis; the other six patients had III, VII, VIII, IX or X nerve palsies, mainly unilaterally. One patient with a ruptured peripheral aneurysm associated with a large AVM had 5th to 10th cranial nerves completely paralyzed. One patient with bilateral 'butterfly' aneurysms had unilateral complete 6th, 7th, and 8th cranial nerve palsies. One 34-year-old woman explored elsewhere both suboccipitally and subtemporal transtentorially, had on the side of the aneurysm facial nerve paresis, unilateral deafness and C9 and C10 completely paralyzed; her aneurysm was clipped uneventfully and finally she made an excellent recovery. Re-

markably, 41 patients of 57, had one or more cranial nerve palsies postoperatively, and in the long-term follow-up period, 24 had one or more persistent cranial nerve deficits. Five patients underwent operation during the first 6 days after bleeding, 32 during the first month, 14 after that, and 16 cases were unruptured. Half of the patients with ruptured aneurysms had multiple bleeds.

In the Drake-Peerless series, the approach was in one of three ways: subtemporal transtentorial, lateral suboccipital or, in unusual circumstances, the transmastoid-transpetrosal approach. Ordinarily, most aneurysms arising on the basilar artery trunk down to AICA were approached transtentorially, whereas those at the posterior-inferior cerebellar artery and up to the vertebral-basilar junction are exposed by the lateral suboccipital-subcerebellar approach. But both AICA and vertebral-basilar junction aneurysms can be exposed by either route if necessary:

The choice of approach depends on the height of the aneurysm on the clivus, its size and projection, and certain other disadvantages of each approach. These are: 1) from above—the possibility of injury to the cranial nerves, fourth to eighth, and, if necessary, an approach under the dominant temporal lobe near the vein of Labbe; 2) from below—injury to cranial nerves 9, 10 and 11.

While the use of temporary basilar artery clipping has relieved much of the danger of an approach over or beside the dome of the sac, the exposure should be that which will best expose the neck and the origin of AICA.

The subtemporal-transtentorial approach requires a temporal bone flap which extends well posterior because the edge of a smaller flap will interfere with the line of sight down the posterior slope of the petrous bone. The mid temporal lobe is elevated to display the edge of the tentorium beside the midbrain. It is most important to preserve the integrity of the vein of Labbe during this manoeuvre; in one case (midbasilar dissection), when it was torn, a fatal temporal venous infarction occurred postoperatively. With the microscope, it is possible to work on one or the other side of an inferior temporal vein or even between the two veins inserting separately into the dural floor while carefully monitoring the retractor pressure and vein stretching.

The tentorial edge is picked up one centimeter or so behind the exit of the fourth nerve for insertion of a suture which is also passed under a bit of dura in the floor of the middle fossa for later tying. The tentorium may be divided from medial to lateral, vice versa or beginning centrally. Preferred is to make the first opening centrally with a sharp hook and a knife in an avascular portion about 1 to 2 cm behind the petrous ridge. Bleeding from tentorial venous sinuses with further division medially is easily seen and controlled with coagulation or clipping. Nearing the tentorial edge, the position of CIV underneath must be identified so that the

edge is divided safely about 1 cm behind the exit of the nerve into the triangular ligament. The divided tentorial artery usually requires a clip on the anterior edge. The tentorium can then be tied forward with the suture to the dura of the floor of the middle fossa, with care not to put undue tension on CIV. Division of the lateral tentorium behind the petrous ridge to a point near the sigmoid-lateral sinus confluence may be done with a knife cutting over a blunt hook as it lifts the tent from the cerebellum. It may be necessary to avoid a large venous lake along this line. The remainder of the anterior tentorial leaflet can be reflected forward on its attachment to the ridge and tied firmly with one or two more sutures to the more lateral dura of the middle fossa. The edge of the posterior leaflet is thoroughly coagulated for hemostasis and shrinking out of the way. The fourth and fifth nerves will be exposed medially under the arachnoid and midway the petrosal vein, which may be one or several bridging from the petrosal sinus to the anterior cerebellum. The vein(s) is divided after careful coagulation, then the arachnoid is opened and more cerebral spinal fluid evacuated.

With a slack brain, very little retraction of the temporal lobe is required, as the tip of the same retractor is worked down over the edge of the anterior cerebellum and over the divided petrosal vein stump just lateral to CV. As the tip is advanced gently to retract the pons from the petrous bone and clivus, the bundle of the seventh and eighth nerves will come into view laterally, and are not to be put on stretch. The final exposure for the lower basilar artery will be in this opening between CV medially and CVII and CVIII laterally.

At first this space may seem too confined, but with suction and further advance of gentle retraction, it will open up considerably to reveal the sixth nerve and its insertion into the clivus. For AICA aneurysms, it may be wise to get an idea of the position of the aneurysm by finding the basilar artery well above by proceeding past the sixth nerve; this nerve ordinarily is slack enough that it can be laid up against the clivus or held under the retractor tip gently on the pons. Handled gently, the sixth nerve, like the third nerve, has a remarkable propensity for complete recovery of function. The arachnoid sheet in front of this space can be a nuisance, repeatedly plugging the sucker tip; splitting it with the scissors avoids this problem. If there is much clot in the cistern, it is best to suck it away in a direction away from the presumed position of the dome of the aneurysm. Forward projecting aneurysms are commonly adherent to the clivus and those projecting laterally or posteriorly are shallowly embedded in the pons.

AICA will be recognized laterally by its loop in proximity to the bundle of CVII and CVIII at the porus. The base of the aneurysm is disclosed by following AICA medially, but as soon as the basilar artery is seen, it

should be freed below AICA for temporary clipping. The long Drake temporary clip (a long Drake clip which has been sprung often enough so that the tips just close together lightly) is useful here since it may be difficult to apply a shorter clip and especially to remove it. The handle and long blades can be tucked away laterally in front of the cerebellum. Then the neck and waist of the aneurysm can be dissected free for clipping, taking great care to preserve the origin of AICA. If the dome is adherent to the clival dura, the first clip application should be in perfect position for occasionally the closure of the aneurysm neck will tug the dome away from the adherent clot sealing the rent. If not in the best position, another clip can be placed out on the collapsed dome to prevent bleeding while the original clip is replaced accurately.

For posteriorly projecting sacs, it is quite possible to work behind and underneath the basilar artery to free the perforators and the neck.

Laterally projecting aneurysms usually have to be freed from their pial bed in the pons especially if they are large. With temporary clipping, the dome can be displaced forward against the clivus with the sucker tip on a patty, as it is freed from the pia down to its base with fine or sharp dissection. For a large dome unduly adherent to the pia, it has been possible to free only the neck from the pons and apply an angled clip from above, or even from below by directing the applier beneath CVII and CVIII.

Rupture of the sac is frustrating because of the narrow exposure and multiple cranial nerves which can be injured with suction or frantic dissection; but the dissection must be completed before clipping after reapplication of the temporary clip. Preservation of AICA is essential. Inadvertent rupture occurred five times resulting in one death and one poor result.

Bilateral aneurysms arising from the basilar artery at AICA have been seen once (as well at SCA) ('butterfly' aneurysms). In each case, it has been possible to clip both aneurysms, but doing the opposite sac first, with a clip whose blades or handles do not interfere with the placement of the second clip. It has meant working behind the basilar artery on two occasions to clip a posteriorly projecting sac on the opposite side. The origin of the opposite AICA must clearly be identified before such clip placement.

Most large, bulbous aneurysms have been approached transtentorially, although coming down on the dome of an upward projecting sac may be precarious because it obscures the neck and must be freed from the pontine pia. Because of this, in two early cases, the neck was approached through a tentorial opening on the side opposite to dissect on the neck across the midline in front of and behind the basilar artery. While it was feasible to dissect around the basilar artery, the visualization of the neck was not as clear and in one case, the

basilar artery too was inadvertently occluded by the clip, although without effect. Temporary basilar or nearby bilateral vertebral artery clipping makes manipulation of larger adherent domes much easier and safer (was used 5 times). It is a matter of working down the sides of the sac and displacing the waist of the aneurysm with either the sucker tip on a small patty, a spatula or even a narrow retractor blade which will free both hands for suction and dissection. The origin of AICA may be difficult to see under the neck of a large sac, and considerable displacement may be required to be certain the clip has not compromised this vital vessel.

Clip application on basilar trunk aneurysms can be awkward especially with larger sacs, because of the angle of clip application and the nose of the clip applier is large enough to obscure vision. Angled blades and the smallest low profile applier tips are helpful.

In this series, the subtemporal transtentorial approach was used in all but nine patients; seven were suboccipital, another was suboccipital after transtentorial exploration. The last was begun as a transmastoid transpetrosal in a patient who had been explored before suboccipitally. However, when the sigmoid sinus was found thrombosed, it, instead of the petrosal sinus, was divided for the exposure. One patient had a frontotemporal approach for associated aneurysms, but the AICA aneurysm was treated subtemporally.

Clip occlusion was used for most AICA aneurysms arising from the basilar artery. Two were wrapped in gauze and soaked in plastic. One was a blister off a fusiform enlargement of the basilar artery and the other aneurysm was intact and partially buried in the pons so that the neck could not be easily freed; this wrapping was incomplete. Both have had long-term good survival without known recurrence. In one patient a large aneurysm was only explored: clipping proved to be impossible as over 1 cm the basilar artery was incorporated into sac. As the posterior communicating arteries were tiny, temporary basilar occlusion produced apnea, and both vertebral arteries were of equal size, no proximal vessel occlusion was possible. However, she made an excellent recovery, and has remained so for 20 years!

Two of the three peripheral AICA aneurysms without an AVM were clipped but one with a broad neck was treated by proximal AICA clipping without consequence. In one of the clipped aneurysms, AICA was occluded, but filled distally from a PICA-AICA anastomosis. Unfortunately, she became a poor result from a postoperative cerebellar hematoma. Two further peripheral aneurysms, one proximal and one more distal, were trapped with excellent results in both." (1)

Our preference in Helsinki has been a presigmoidal approach with partial petrosectomy and partial mastoidectomy, but the choice of approach depends on the height of the aneurysm on the clivus, its size and projection, and certain

other disadvantages of each approach. We will try Dr. Batjer's technique recommended in his comments.

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Ayse Karatas
Keisuke Ishii
Mika Niemelä
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-
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In Reply:

We appreciate the letter to the editor from Dr. Hernesniemi regarding our recent paper on anterior inferior cerebellar artery (AICA) aneurysms (1). Several points deserve comment. Our series represents the experience of a single institution and a single surgeon (RFS). Patients were carefully selected. Only those with an aneurysm at the emergence of AICA from the basilar trunk or along the course of the artery were included; patients with mid-basilar trunk aneurysms were excluded.

First, the rarity of these aneurysms and the complexity of their treatment are reflected in the frequency of complications. The rate of cranial nerve deficits is high, particularly involving the sixth cranial nerve.

Patients with ruptured aneurysms constitute the majority of both Dr. Drake's and Dr. Spetzler's series. As described by Dr. Drake, operating in a delayed fashion allows the "effects and consequences of the hemorrhage" to pass. Securing the aneurysm early prevents rebleeding and allows vasospasm to be treated in an aggressive fashion.

Identifying the relation of the aneurysm's neck to the axis of the clivus and the position of the aneurysm along the artery's course are key factors in choosing a surgical approach. Based on these two factors, AICA aneurysms can be approached from a variety of angles (e.g., orbitozygomatic, subtemporal, Kawase's, retrosigmoid, or transpetrosal approaches and their variants, and the far-lateral approach for low-lying aneurysms).

The senior author's choice of approach has come full circle. At the beginning of his career he preferred the retrosigmoid approach. For a time, he then used more aggressive approaches (e.g., transpetrosal). Most of the aneurysms later in this series were accessed from a retrosigmoid approach with a trajectory that parallels the petrous bone.

We rarely use the subtemporal approach because it has two primary disadvantages. The temporal lobe must be retracted, and the surgical corridor must avoid the inferior temporal vein, which can have multiple branches. In contrast, a trajectory that parallels the petrous bone, as in the retrosigmoid approach, facilitates dissection and limits retraction to the cerebellum. The pons need not be retracted.

Finally, we acknowledge Dr. Drake's supreme contribution to vascular neurosurgery with his experience of almost 2000 posterior circulation aneurysms. We regret that we did not cite the other valuable chapters that Dr. Hernesniemi mentioned.

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1. Gonzalez LF, Alexander MJ, McDougall CG, Spetzler RF: Anteroinferior cerebellar artery aneurysms: Surgical approaches and outcomes—A review of 34 cases. *Neurosurgery* 55:1025–1035, 2004.

DOI: 10.1227/01.NEU.0000181086.46032.0D

The Science of Shrinking Human Heads: Tribal Warfare and Revenge among the South American Jivaro-Shuar

To the Editor:

I have read with great interest the article by Jandial et al. (2) regarding the custom of shrinking human heads by the Jivaro-Shuar people. The Jivaro population is an ethnolinguistic culture formed by four dialectic groups who live in the basin of the Amazon river in Ecuador, Venezuela, Colombia, and Peru. They are the Shuar, Achuar, Aguaruna, and Huambisa tribes. All of them, as well as some of the neighboring aborigine tribes in Brazil, used to shrink their enemies' heads. The Jivaro's practice of shrinking human heads should not be considered as an exceptional fact. On the contrary, it should be considered as a special way of taking *trophy heads*: a widespread practice among the multiple head hunter pre-Columbian indigenous communities who lived in South America from the Pacific coast to the Andean plateau and from there to the Amazon basin.

Many pre-Incan cultures, such as the Paracas and Nasca people (900 BC to AD 750), rendered a special cult to the human head carried out by means of ritual ceremonies or practices. Among them, it is worthy to mention the *trephinations*, which have been performed since at least 500 BC for trauma, headaches, epilepsy, or mental disease, but also executed during thaumaturgic or religious rituals with an exorcist intention (3, 4). Another form of cult was the *intentional deformation of newborn head*: a widespread practice performed within the ancient Andean cultures with the idea of differentiating social or ethnic groups or for aesthetic, magic, or religious reasons (5). Another rite was taking *trophy heads*. They were taken in two ways: as a warfare practice on their enemies or by sacrificial practices on children, women, and the aged. This was one of the oldest and most

widespread rites the ancient Andean people dedicated to the human head: ritual decapitation dates back to 200 BC.

Trophy heads have been found during excavations throughout the burial areas of the Paracas and Nasca region, as well as illustrations showing warriors and fantasy creatures with such trophy heads. Many Nasca and Moche culture designs feature trophy heads on pottery and textiles, and many Nasca motifs indicate that head shrinking might also have been practiced by these people. Excavations performed at the Wari culture site of Conchopata (AD 600–1000) in the central Peruvian Andes have uncovered trophy heads associated with oversized ceramic urns depicting trophy heads in various forms. Similar findings have been found among the Mundurucú and Parintintins Indians in Brazil and among the Colimas, Panches, Muisca, Caribes, and Quimbayas tribes in Colombia.

During armed conflicts among pre-Incaic indigenous populations, trophy heads were taken from the enemy and publicly displayed with a ritual significance afterwards, as a symbol of bravery. The occiput was removed to remove the brain, then the head was filled with textiles or grass, and, finally, the eyes and lips were sealed shut with cactus thorns to prevent the head—according to the belief of these people—from harming his murderer. Some indigenous communities used to exhibit the trophy heads or the trophy-skulls by placing them on a wall at the entrance of the houses as a symbol of personal courage of their owners, whereas others impaled or hung them at the accesses of the towns as a sign of intimidation (Fig. C10). The Chavín, Nasca, Paracas, and Tiawanaku populations in Peru used to drill a



FIGURE C10. Impaled trophy-skull.

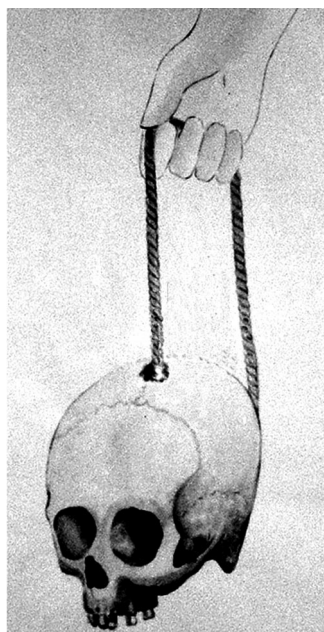


FIGURE C11. Trophy-skull as it used to be carried hanging from Indians' belts.



FIGURE C12. Trophy-skull. See the hole drilled on the vertex (courtesy, Dr. Eduardo Casanova Archaeological Museum, Tilcara, Jujuy, Argentina).

small hole in the middle of the trophy-head's forehead, whereas other tribes (such as the Aymara and the tribes of the northwestern areas of Argentina and Bolivia) drilled a hole at the skull vertex with the aim of passing a piece of cord through it so as to carry the enemy's head hanging as a trophy from their belts (Figs. C11 and C12). This was also a custom among Jivaro people, but they shrank the enemy's head first to eliminate, according to their belief, his "avenging soul." Therefore, shrunken heads meant more than a battle trophy for them: they held power and prevented vengeance.

Much has been written with regard to barbarian customs of these "primitive cultures," but little about the barbarian customs of the "civilized" conquistadors. There is, without a shadow of a doubt, a merit in Jivaro people which can not be denied: the fact that they have been almost the only tribal group in America that successfully repelled European invasions into their homeland (1).

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In Reply:

I thank Dr. Schijman for his comments regarding our article (1). Indeed, the practice of shrinking human heads was a

widespread practice among the pre-Columbian people of Peru, Ecuador, Venezuela, and Columbia. Other practices, such as trephination and intentional deformation of newborn heads, were also performed among these people, as well among populations in Africa and Asia. The practice of taking trophy heads from enemies in war is one that seems to have been widespread in the northwestern portion of pre-Columbian South America. The making of ritual shrunken heads, or *tsantsas*, as performed by the members of the Jivaro-Shuar of Ecuador and Peru seems to be a vestige of this ancient custom. Although an entire spiritual system underlies the manner in which these trophies are made and celebrated, the products alone have done much to capture the Western

imagination. The technical aspects of just how human heads are rapidly collected from victims and made into solemn, ritual totemic objects offer revealing insight into the sophistication of such an ancient culture.

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1. Jandial R, Hughes SA, Aryan HE, Marshall LF, Levy ML: The science of shrinking human heads: Tribal warfare and revenge among the South American Jivaro-Shuar. *Neurosurgery* 55:1215–1221, 2004.

DOI: 10.1227/01.NEU.0000181087.53655.DD
