

## TESTIMONY OF DR. MICHAEL BADEN—Resumed

Dr. BADEN. That's correct.

Mr. PREYER. If you would like to step over to that. As I understand your testimony, you were able to—let me put it this way: Are you able to see a penetration of the skull bone in the higher area where you say the entry wound occurred?

Dr. BADEN. Yes, sir, on this and on the other lateral X-ray, next in number, all the members of the panel, and I think Dr. Petty, Dr. Wecht are here in the room with us now who are members of the panel, we all agreed that the entrance perforation was at this point where there is a separation and an obvious fracture depression on the upper back aspect of the skull.

This perforation has been made more prominent for the members of our panel than the doctors in 1963 because of the X-ray enhancement technique. We are unanimously agreed that this is an entrance perforation.

An additional reason for this conclusion, aside from the fact that it is a depressed fracture, is that there is a metal fragment here which shows up clearer on the original nonenhanced X-ray. This original X-ray shows a piece of metal that rubbed off from the bullet on entering the skull and was deposited at the entrance site which also is typical of an entrance perforation. This piece of metal is clearer on the original X-rays at the site of entrance and from it radiates many fracture lines, also typical of an entrance wound.

May I have the other X-ray blowup showing the anterior-posterior front view?

So, we were in agreement, as were all of the radiologists that we consulted with—Dr. Davis, Dr. Seaman, Dr. Chase—that that is the point of entrance in the right upper back skull with radiating fractures.

Mr. PREYER. And can you say, from looking at those exhibits, that there is no evidence of penetration of the skull 4 inches lower than the original—

Dr. BADEN. Yes, sir. The original X-ray shows it best. About 4 inches below our placement of the entry perforation is the external occipital protuberance, which is the little boney bump in the back of the head that we can feel right in the midline; this is approximately the place where the autopsy surgeons placed the wound of entrance.

On these X-rays and on the enhancements of these X-rays, there is no evidence of any perforation in this area. The autopsy physicians—Dr. Humes, Dr. Boswell, Dr. Finck, and Dr. Ebersole, who was the radiologist present—all agree that there was one and only one entrance wound in the back of the head. They describe the wound's appearance in accord with other available evidence, but they place it 4 inches lower than the panel places it.

So, the disagreement is a matter of the proper placement of a single entrance perforation rather than any reasonable possibility of two perforations.

Mr. PREYER. And I believe on the enhanced photograph, you identified metallic particles left in the top of the skull?

Dr. BADEN. Yes, sir.

Mr. PREYER. Is there any evidence from any photograph or any X-ray you have seen of a bullet entrance lower down than the one

you have described and other metallic fragments or penetration of the skull or any other sort of evidence?

Dr. BADEN. No, sir. May I use an exhibit that wasn't shown, a diagram of the brain, Mr. Chairman? A drawing, it is a diagram, not a picture.

Chairman STOKES. Yes, you may.

Dr. BADEN. Thank you, sir.

Mr. PREYER. It is 302, I believe.

Dr. BADEN. Thank you, sir. There is present evidence of a bullet track only in the upper portion of the skull; these metal fragments have moved a bit because some of the fragments are in the loose scalp tissues and soft tissues that are movable. There is no evidence of any metal fragments in the lower portion of the skull in the X-rays, nor in the photographs.

Now, the brain, as was mentioned, is not available for our examination and was not thoroughly examined, nor examined even in the normal fashion, in 1963. However, it was described externally and many photographs were taken of the brain. Miss Dox has prepared a diagram of the brain as seen here, which shows how the brain looked when it was examined and before it was misplaced or lost. This fairly and accurately represents the extensive damage, and injury to the right top of the brain, that I am pointing to, that is apparent in the photographs.

This, on the left side, is what the normal brain looks like and what the appearance would be on the right side if it were not injured by the bullet track. We do see some of the lower portion of the brain here, the cerebellum area. This area would have to be injured, in the unanimous opinion of the medical panel, if a bullet entered in the lower scalp area near the external occipital protuberance which is the area of discussion relative to a second lower bullet in the back of the head. We did not see any photographic or X-ray evidence of, and there is no description indicating any injury of, the brain other than the extensive damage to the right upper part of the brain consistent with the upper track which the panel agrees to.

Mr. PREYER. Thank you very much, Dr. Baden.

I think that has clarified that. If you will take your seat.

Dr. BADEN. Thank you, sir.

Mr. PREYER. Incidentally, what happened to the metal fragments that you have stated were found in President Kennedy's skull? Were they removed?

Dr. BADEN. There were some fragments removed in the course of the autopsy and preserved and kept at the Archives. They are very small fragments. They have been much enlarged on the blowups; some fine fragments were removed and preserved and kept in the custody of the Archives.

Mr. PREYER. Thank you.

There were several other discrepancies between your report and the Ramsey Clark panel's report and the Rockefeller Commission report which I would like you to comment on briefly. You testified that the bullet which passed through President Kennedy's back and out of his throat did not leave any fragments, and, as I understand it, at least one of the doctors on the Rockefeller Commission panel did state that there were metal fragments left by that bullet.

Do you have any comments on that?

Dr. BADEN. Yes, sir. That, in fact, was a conclusion by one of the members of the Rockefeller Commission and was an area of concern that the panel did spend time examining. If we are able to have X-rays of the chest of President Kennedy placed on the easel, I think I can explain to you how we approached that issue, what we did and what our conclusions were. There is present in the right neck region, as seen on the chest X-ray taken prior to the autopsy, a small white area that has the appearance possibly of metal or bone. That was one of the reasons that the panel requested, and the staff did go to great troubles to have made, enhancement and enlargement photographs of that area of the X-rays. We did resolve that issue to our satisfaction, as I will show you, if I can use those exhibits, please.

On your right is an X-ray taken of the President just prior to autopsy showing the neck, the area where the bullet passed through, and the lungs.

This is an enlargement of a portion of the X-ray taken while the autopsy was in progress to see if there was a bullet in the body; none was present.

This fragment did raise some concern with the Rockefeller panel and with our physicians because it has some appearances suggesting that it is a piece of metal which would indicate that the bullet struck bone in the area as it passed through the neck.

We have concluded that there is a fracture of the transverse process of the first thoracic vertebra which could have been caused by the bullet striking it directly or by the force of the cavity created by the bullet passing near to it.

However, after obtaining the enhancements of the X-rays and after consulting with various X-ray specialists, Dr. Davis here in Washington, Dr. McDonald in California, and others, we have concluded that what appears to be a radioopaque, white metal fragment is, in fact, an artifact: it is not a piece of metal, it is not a piece of bone, and one reason for this conclusion is that it is not present in the first X-ray that was taken. Careful examination of that X-ray shows no evidence of any metal or bone or fragments in the neck area. We are satisfied that the most reasonable explanation for this artifact is that it is due to a piece of dirt present on the X-ray cassette or that it was produced during the X-ray developing process which occurs not uncommonly as can be seen on other of the President's X-rays.

We are satisfied that it does not represent bullet or bone.

Mr. PREYER. Incidentally, you mentioned the bullet nicking the vertebra. Could the bullet, CE-399, the pristine bullet, have nicked President Kennedy's vertebra and still have left the neat, clean exit wound in the throat?

Dr. BADEN. Yes, sir. Usually, when a bullet strikes something of substance, it will begin to wobble, but as a bullet wobbles, there are times when it will be alined in a straight-on directional course. As I am demonstrating by using this wooden pointer there are times when, even if it is wobbling as it is moving, it will be in a straight-on position.

If the bullet did strike bone, and we cannot be certain of that, it may nevertheless have stayed on course; it may have begun to

wobble after it came out from the neck. If it were exiting in a direct head-on fashion and the skin were made more firm because the collar and the shirt were reasonably snug around the President's neck, these factors would tend to make the exit skin hole small. There is no disagreement among the panel members that the perforation in the front of the neck is an exit wound, despite early Parkland Hospital confusion, and this was also the conclusion of the Rockefeller panel and the Clark panel.

Mr. PREYER. Thank you, Dr. Baden. I believe we can try again from your seat here.

One discrepancy, I think, with the Clark panel, the Ramsey Clark panel, was put together in 1968, I believe—

Dr. BADEN. Yes, sir.

Mr. PREYER. That was that they located the wound on the President's neck in a different area from where your panel has located it.

Dr. BADEN. Yes.

Mr. PREYER. Could you comment on that?

Dr. BADEN. Yes, sir. Miss Hess, could we see the neck diagram and the neck photograph?

The Clark panel, which had two fine forensic pathologists as members, Dr. Russel Fisher and Dr. Moritz, who are senior forensic pathologists and well experienced, did conclude that there was a wound of entrance in the back and exit in the neck. In describing the wound that we see here, that semicircle at the lower margin of the tracheostomy incision, the Clark report locates it in the upper margin of the incision.

It is a trivial mistake and in no way does it change the significance of the injury and the interpretation of the injury; but it does reflect, I think, the problems that forensic pathologists have when they make reports while not directly looking at the object being described as would have happened if the description was made sometime after seeing the archival photographs. This same type of error, preparing the autopsy report 24 hours after the autopsy was completed and after the body had been removed, may have contributed to the more significant mistake of placing the gunshot wound of entrance 4 inches lower than it actually was. The description of the size and shape of the entry wound is correct, but the location of it is incorrect perhaps due to reliance on memory.

Mr. PREYER. You have described your findings at some length from photographs and from X-rays. I am sure the question will occur to a lot of people, did you perform any experiments to see if the damage caused by the pristine bullet could have occurred and the bullet still be so slightly damaged? If not, why not?

Dr. BADEN. The panel did review the experiments that have been done, and the panel members, in evaluating the desirability of doing further experiments—and we had long discussions about this—were in agreement, save for Dr. Wecht, that it is impossible to perform experiments to duplicate the injury patterns in President Kennedy or Governor Connally, or in any other individual who dies.

We can do experiments to see how much powder is produced by a gun at a certain distance; but even in wartime—and civilian life occasionally in New York City—when people are killed by

machinegun fire, with the machinegunner firing multiple rounds within seconds at a relatively stationary person, the bullet paths and injuries produced are never duplicated. The slightest difference in weight of the ammunition, in manufacture of the ammunition has significance; the gun that is fired 12 times is different than the gun that is fired 13 times; the slightest contraction of muscle, any injury causes the next bullet fired to take a different course and a different path and produce different injuries.

And it is the opinion of many of the panel members that even the doing of experiments in this regard, to reproduce the President's, the Governor's, and the bullet's injuries does more to obscure the issue than to clarify it; gives a credibility to experiments on people in reproducing injuries that is not warranted and may be very misleading.

Humans are not guinea pigs that can be put in cages and can be standardized. The dead bone, the dead wrist bone, the dead thigh bone is different than the live thigh bone. A bone with blood going through it reacts differently to a gunshot wound than a dried bone without blood going through it. These differences not only affect the path of the bullet going through the body and the injuries produced, but also affect the damage done to the bullet; a hair's breath difference in distance between two bullets similarly fired will cause one bullet to shear in half and split and the other bullet to go straight through the body without the missile being greatly damaged.

I don't want to belabor the point, but the panel majority after much consideration does feel that the injuries sustained by Governor Connally and President Kennedy, and the trajectory and the ballistics could not be precisely duplicated; that there were myriads and myriads of ways the experiment could be done wrong and only one way it could be done right—and if by chance it were done right once we wouldn't know it or be able to prove it. There would still be room for argument.

Mr. PREYER. So, the problem in duplicating the wounds are so complex that you would create more problems than you would solve by conducting experiments of this nature?

Dr. BADEN. Yes, sir, it is a futile search that produces a false confidence in uninterpretable data. In our everyday practices, when we have to make judgments about gunshot wounds and injuries, we do not do so by performing experiments. We make that judgment by looking at the evidence, by taking everything available into consideration and then by drawing a conclusion; not by attempting to duplicate the impossible.

Mr. PREYER. Finally, let me just ask you a couple of questions about something that I think troubles people more than anything else about the autopsy.

That is, the fact that a bullet could appear to do so much damage and still remain in almost pristine condition. It seems to fly in the face of commonsense. Let me ask you, have you ever seen a bullet that has done this much damage as the bullet CE-399 did and still emerge in as good condition as this bullet is in?

Dr. BADEN. Yes, sir. Absolutely, but with qualification. We on the medical panel have certain problems, as have other doctors in the past, in evaluating the injuries produced by the so-called "pristine

bullet", which is a media term that is inaccurate: it is like being a little bit pregnant—it is either pristine or it is not pristine. This is a damaged bullet and this is not a pristine bullet. This is a bullet that is deformed; it would be very difficult to take a hammer and flatten it to the degree that this is flattened. This is a partially deformed bullet with a heavy jacket.

The problem is that although in New York City we see more than 1,000 gunshot wound deaths a year, in a civilian population it is most unusual to encounter military ammunition; and in military practice where people are killed by rifle bullets, autopsies, and follow-up correlations are not performed as in the civilian death situation. Very few people, if any, have had autopsy experience with the Mannlicher-Carcano 6.5 millimeter ammunition in a civilian population.

However, we do see copper-jacketed handgun bullets not infrequently, and typically, a copper-jacketed handgun bullet will cause extensive damage and deform very little. In fact, according to the Geneva Convention, military bullets must be jacketed so that they do not split up and deform. They are meant to cause minimal injury and suffering while killing somebody; the bullets are designed so as not to break up into many different parts and to be minimally deformed.

Mr. PREYER. It only caused death and no side effects; is that it?

Dr. BADEN. That is correct. It stays intact. Further, sir, in fact, this bullet struck little that would deform it. The track through President Kennedy is essentially through soft tissue which does not deform a bullet. The only injury to the chest of Governor Connally that could have damaged the bullet would have occurred if it struck the fifth rib. But the rib is a very thin bone and striking a rib does not significantly deform a copper-jacketed bullet. So, the only impact that caused any appreciable damage to that bullet occurred when it struck the lower forearm.

Do you have that X-ray of Governor Connally available? This X-ray of Governor Connally's forearm shows the radius bone of the forearm, the only object that that bullet, C.E. 399, struck that could have caused only significant damage to the bullet. It is the opinion of the panel that the impact with the radius bone did cause some flattening of the bullet, but it would not necessarily be a very marked deformity. Impact that causes great damage to a bullet typically occurs when the bullet strikes skull bone or spine bone, which are hard and tough bones. The wrist, the radius at that point where you see the fracture lines, is not a very hard bone. It can damage some bullets, and not others.

It is hard to predict. We have seen many bullets that go through radius bones that are very little deformed. The bullet struck only superficial soft tissues of the left thigh where its course terminated; this impact would have caused no damage to the bullet.

Mr. PREYER. I was going to ask you how you explained the massive fragmenting of the bullet from the head wound compared to the relatively undamaged bullet from the throat wound?

Dr. BADEN. The skull bones are much denser and harder and provide much more resistance especially if the bullet should strike at a sheering angle. The skull bone is a round bone and often a bullet like this may enter the skin head on but, when it hits the

bone beneath, because of the curvature, the lines of force are different than when it goes through a flat bone like the radius. It is typical for bullets striking the head to be much more damaged than bullets going through a rib or a wrist; in fact 399 did not strike much that would cause it to be damaged.

But to get back to your original question, if you asked me can I produce a bullet that similarly went through two individuals, I could not because of the uniqueness in the way people are shot and the way people die.

Mr. PREYER. The final question I have, Dr. Baden, you mentioned that part of the information on which you based your conclusions that the single-bullet theory was valid was that no other bullet was found. If another bullet would have turned up, or should turn up, say in the upholstery of the car, would that affect the validity of the single-bullet theory, that is, that one bullet passed through both President Kennedy and Governor Connally?

Dr. BADEN. I think that if another bullet were found in the car, the pathology panel members would have to give that a great deal of consideration before reading its final conclusions. The problem with bullets going through people, through multiple people, which happens from time to time in ordinary civilian practice, or going in and out of one part of the body and into another part of the body, is that it is never possible to say that the only possibility is a single bullet from the autopsy findings alone. The circumstances are very important in interpreting the autopsy findings.

All we as pathologists can do is say they line up together; one bullet could have caused both injuries, but if the two people, if the arm and the chest were held apart and two bullets were fired at appropriate angles, it is possible to simulate tracks with two bullets that could be caused by one bullet. Presence or absence of the reentry characteristic would be important in interpreting the findings.

We are taking into account in our evaluation the Zapruder film, the fact that the President and the Governor are in certain positions, seated down, one in front of the other; from the autopsy point of view they line up. The bullet going through the President would have enough steam behind it to reenter the Governor.

Further, the appearance of the Governor's wound indicates that the bullet entering the Governor struck something before it hit the Governor. There is no evidence of striking anything else in the vicinity of the car, although it is possible; but being reasonable and trying to examine all of the possibilities in the context of the medical evidence available, we find that the bullet that struck the President in the upper back had no other place to go, went no place else, except into the person in front of him, the Governor. And that there is no other place that the bullet going through the chest could go but the wrist. It would be possible for another bullet to have been fired from another point and caused the same injuries to the Governor. This is highly unlikely. In civilian practice with experience with thousands of bullet wounds the majority of panel members find it very significant that the wounds line up: If the shoe fits, it fits.

If the bullet in the hand and the chest line up as consistent with coming from the same bullet track, invariably, when all the evi-

dence is in, this proves to be the correct explanation; but it is not necessarily the only explanation. It is just there are so many ways people can be shot; myriads of ways people can be shot that don't line up. If the bullet paths line up in a way so that they are possibly caused by one bullet, that in itself eliminates countless other possibilities.

Mr. PREYER. Thank you, Dr. Baden. I have no further questions, Mr. Chairman.

Chairman STOKES. Time of the gentleman has expired. Committee will now operate under the 5-minute rule.

The Chair recognizes the gentleman from Ohio, Mr. Devine.

Mr. DEVINE. Thank you, Mr. Chairman.

Dr. Baden, you are obviously eminently qualified with your vast experience in the field of forensic pathology. I know of the general reluctance of members of the medical profession—as well as indeed, lawyers—to be critical of their colleagues or their work, and keeping that in mind I am wondering could you elaborate more fully on the conclusions the panel reached regarding the autopsy procedure? Do you have anything you would like to enlarge upon in that regard?

Dr. BADEN. Yes, sir. As was mentioned previously, we are going to include in the report a full documentation of critical analysis of the autopsy report. I would say that, as you will find today and perhaps other times, that although many physicians are hesitant to criticize one another, that is not the rule among forensic pathologists, and I think this is a good rule because the forensic pathologist is often in the court room and has to call it the way he or she sees it.

I think in this regard, perhaps as a caveat, we did agree as a group with the basic bottom-line conclusions of the original autopsy doctors: Two bullets from behind struck the President and only two bullets. However, we had a great deal of concern on many levels as to how the autopsy was performed, beginning immediately with the assumption of jurisdiction by what appears to be the Federal Government and the family of the President, intruding into what was at that time a State crime, homicide. The effect of that was to remove the body from Dallas, the jurisdiction which had a very competent forensic pathologist in charge, Dr. Earl Rose, who happens to be a member of our panel presently, to Bethesda at, apparently, the request of the family.

The experience of each and every panel member is that in a homicide situation the last person to have control and tell the medical examiner how to proceed or what to do is the family of the next of kin. This is a rule that we live with while still keeping the sensitivities of the family fully in mind.

The very concept of the family having control of the body, of the family having control of the archival material although done with the best and noblest of intentions, does cause great concern for forensic pathologists because of its implications in other homicides where the family does not and is not permitted and should not be permitted to have control over what happens to the bullet that killed Uncle Louie. The district attorney handles that and not the family.



As a result of that move of the body many things happened. In all fairness, Dr. Humes is here and will speak later. Some people assume authority and upon others authority is thrust as happened to Dr. Humes. He was later to become president of the American Society of Clinical Pathologists. A well experienced hospital pathologist in the scheme of things, he had not been exposed to many gunshot wounds and had not performed autopsies in deaths due to shooting previously: neither had the other autopsy pathologists present. So they were required to do an autopsy that by experience and by the way our society is structured in the United States, is reserved for forensic pathologists and coroner's pathologists.

As a result of that, certain things didn't happen. The kinds of documentation, pictures, measurements, that the forensic pathologist does automatically and that a hospital pathologist had no need to do. Further, the forensic pathologist knows that he must speak to any physician who treated or touched the body of the decedent prior to the pronouncing of death before the autopsy is done, just to determine what the doctors did to the body—in this instance to learn that a tracheostomy had been made through a bullet hole.

From our vantage point it appears to be a rule among clinicians, those people who deal with live patients, that if there is a perforation in the body, a tube will be stuck into it, the doctors will enlarge it, or they may incorporate it into a surgical incision. This goes for bullet wounds and stab wounds. This is what we deal with every day as medical examiners in our different jurisdictions. This is not what Dr. Humes and his colleagues deal with or are exposed to at Bethesda Hospital. That created a problem. We forensic pathologists insist on seeing clothing as part of the homicide examination, we must see the clothing because we know from experience that the clothing tells us a great deal about bullet holes, about injuries, that may be obscured in the body. It tells if a bullet struck the clothing but missed the body, for example, which may be important. It gives information as to distance, as to whether the bullet is wobbling, et cetera. The clothing was not examined.

The autopsy itself is conducted differently by a hospital pathologist than by a forensic pathologist. The former is not trained to reconstruct the skull, to put the bones together, preserve evidence appropriate for subsequent medical or legal proceedings, et cetera.

I think the preservation of evidence, the finding of all those little bits of pieces of metal fragments Mr. Preyer referred to, are more important to us as forensic pathologists than to the regular pathologist or surgeon because preservation of evidence is not necessarily relevant to treatment.

The question of how extensive an autopsy should be done becomes an issue. Should a complete autopsy be done? In a homicide, yes, because of medical and legal questions that may be anticipated to arise. The state of the various organs may prove important. Heart diseases, brain tumors, and other natural diseases may not have caused death but may relate to other questions that come up as to how a person acted prior to death. Chemical analysis may also be an important part of the post mortem examination.

Mr. DEVINE. Dr. Baden, I presume that you, as the spokesman for your panel, are convinced that your findings are accurate and that any deviation from the original autopsy that was conducted under

very highly charged emotional stress, the fact that the first group of physicians were involved with trying to attempt to save the President's life, rather than determine entrance and exits of wounds, and so forth, and you are persuaded today as you testify here that your findings, the findings of your panel, are accurate and the previous findings that were different are in error?

Mr. BADEN. Yes, sir. However, as to certain of these differences, in particular, the placement of the entrance wound in the back of the head and of the exit perforation in the neck, after further recent discussions with the original surgeons, Dr. Perry, Dr. Carrico, Dr. Shires, we find that we are not now in disagreement. There are some persistent disagreements between the panel and the autopsy doctors in Bethesda particular as to the location of the entry head wound.

I wish to point out and emphasize that the doctors performed the autopsy in Bethesda in a military situation, with a lot of superior officers who were not forensic pathologists present; this creates a pressure, I think, that we are more able to control in the civilian setting where the medical examiner can ask the chief of police or the mayor's representatives or the chief Rabbi to please leave the autopsy room if we deem this appropriate so that the autopsy can be done under our terms. We can do that in civilian life. It is difficult to do that in a military setting, and that situation itself generates procedures and a tentativeness that may produce disagreements later.

Mr. DEVINE. I think this atmosphere should be pointed out for the record and I appreciate your comments. Thank you, sir.

Chairman STOKES. Time of the gentleman has expired.

The Chair recognizes the gentleman from the District of Columbia, Mr. FAUNTROY.

Mr. FAUNTROY. Thank you, Mr. Chairman.

Dr. BADEN. I would like to return to the skull injury.

You viewed with us yesterday the Zapruder film which we and the American people saw several times. You are aware that because of the direction in which the President's body moved, namely, backwards and to the left, it appeared that the bullet had come from the front. Of course, your finding substantiates that of the Commission that two shots came from the rear.

Today you mentioned the presence of beveling in the President's skull. I wonder if you would explain, using a diagram, what causes beveling and how it can be interpreted to learn whether a wound is an entry wound or an exit wound?

Dr. BADEN. Yes; I think Miss Hess is putting up a diagram that we have not used. May I address that please? Thank you.

Because of pressure of time this morning we didn't include all of the materials that might have clarified some issues you are raising, sir. This diagram is to illustrate the beveling concept that I referred to this morning, which was of great importance to us in working out the direction of the bullet wounds in the head and in interpreting the bullet wounds. A bullet entering a bone, like a BB or bullet entering a thick plate glass window, will create lines of force and fractures in the bone or the glass, radiating outward from the point of entrance; a bevel or a concavity will occur in the

bone or glass consequent to these fracture lines in the direction in which the missile is going.

Thus, a bullet entering the skull will cause beveling on the inside of the bone. The skull bone consists of an outer plate and inner plate. Coming in from the outside, the bullet will cause a small round sharp edged hole of the outer table and a concavity or beveling of the inner table, a circumferential defect. Going out, the bullet will cause beveling on the outside of the bone. This is of great assistance to the forensic pathologist in determining which way the bullet is going. Clearly the perforation in the right front side of the head near the suture line, where the two bones joined, as I referred to earlier, had this type of outer bone beveling, which did match up with the separately received triangular bone fragment, indicating that it was the site of an exit perforation.

Do you have that blowup of the X-ray showing the three bone fragments? Thank you. That same beveling was present on one of the fragments of bone found in the car. This fragment of bone found in the car, in the limousine, and brought up to Dr. Humes and his colleagues while they were doing the autopsy, proved to be of value in that one showed a margin of beveling on the outer surface, which permitted the doctors at that time to state there was a bullet wound of exit in the right front head region. It shows some pieces of metal deposited in the area of the beveling. The autopsy doctors also describe in their protocol the entrance wound in the back of the head with beveling of the inner table and an exit wound in the front with beveling of the outer table.

This is consistent with what we could see on the negatives and on the photographs of both wounds, and permits us to give the direction of the track.

Mr. FAUNTROY. Thank you.

Mr. Chairman, I know my 5 minutes are up and I may have other questions later, but for the record, may we have these two illustrations entered at this point?

Dr. BADEN. This one was entered earlier. This one was not.

Mr. FAUNTROY. Let's have this.

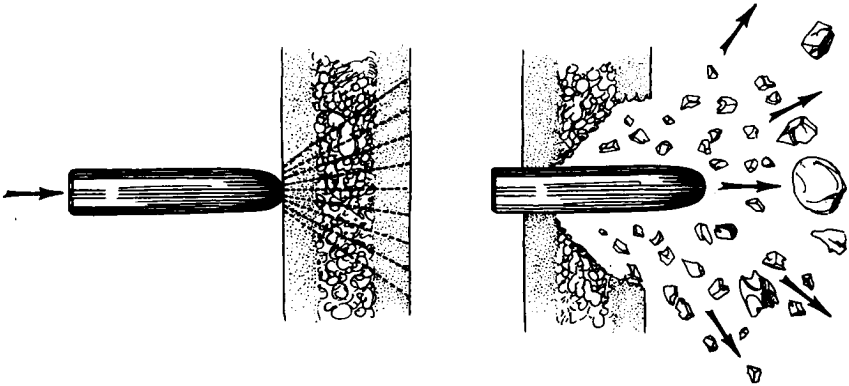
Chairman STOKES. Without objection, the other exhibit may be entered in the record at this point.

Mr. FAUNTROY. What is the number?

Dr. BADEN. It is F-61.

Mr. FAUNTROY. Thank you, Mr. Chairman.

[The above referred to JFK exhibit F-61 follows.]



JFK EXHIBIT F-61

Chairman STOKES. Time of the gentleman has expired.

The Chair recognizes the gentleman from Connecticut, Mr. Dodd.

Mr. DODD. Thank you, Mr. Chairman.

Dr. Baden, I just have two questions I would like to address to you, if I could.

In your response to questions from Mr. Klein early on in your testimony, in talking about the wound in the President's back, you said that an entry wound and an exit wound do not cause the same kind of perforation, except under certain special circumstances, or in special cases. I wonder if you might describe what you mean by special cases, was this a special case, if so, why, if not, why not?

Dr. BADEN. The description of the perforation in the front of the neck, from the original autopsy doctors, and from the persons who had best visualization of it, the surgeons who did the tracheostomy, Dr. Perry, Dr. Carrico in Parkland, essentially only describes it as a small perforation, I think 6 or 7 millimeters at most in diameter. An exit bullet hole can have an abrasion collar, of it is shored. A shored exit wound can have an abrasion collar, if it were firmly in place, or if the skin is against the wall or a hard surface at the time the bullet exits the body, because as the bullet goes out it rubs the skin against the object on the outside such as heavy clothing or a hard surface.

We don't know if this exit perforation had an abrasion collar because it was not that clearly looked at. The doctors were expending all of their efforts to try to save his life. We do not know the perforation was small. The exit perforation is made smaller by clothing tight around the skin.

By chance the bullet exited through the windpipe right at the point where the collar is buttoned against the neck, as seen on the clothing exhibit; this amount of pressure against the skin can prevent an exit hole from being bigger than it might otherwise be. So, although an exit perforation may be small without any clothing or constraint about it, the tighter the constraint the smaller it will be, even to the possibility of arriving at an abrasion collar that looks like an entrance wound. But with all of the other evidence at

hand, and after interviewing all of the surgeons, and all of the doctors who saw the President, I think there is unanimous agreement presently among the physicians and scientists who have been involved, that the perforation of the neck indeed was an exit perforation. There was some misunderstanding of this initially, but that has been worked out and our panel is unanimously in agreement that the neck wound is an exit wound.

Mr. DODD. Are you satisfied that the clothing, the tie and the collar, the tears or rips in them, were caused in fact by the bullet exiting or were these like the other, the jacket and so forth, possibly cut away or ripped away by the surgeons operating in Dallas? Do you have any information which could specifically clear up that controversy?

Dr. BADEN. Yes, sir. We could find no evidence that the tie or shirt collar was torn or cut during removal. The perforation itself, although it might look like a cut to the casual observer, is typical of the slit-like irregularity produced by an exiting bullet. A bullet will destroy some of the clothing on entrance and produce a roundish type hole the edges of which cannot be approximated because there is a little bit of fabric missing. In an exit perforation of this nature, not only is there a jagged slit-like, but not sharp, tear of the fabric, but in addition there is no loss of clothing fabric, so the edges can be approximated as in this instance.

The tear in the tie and shirt collar directly overly the neck perforation the doctors saw at the Parkland Hospital. There is no other hole in the fabric. We can conclude beyond a reasonable degree of medical certainty that the slit-like hole in the shirt and the nick in the tie were caused by whatever came out of the neck and not by a knife. A knife would cause a sharper tear than present here.

Mr. DODD. As I understand your testimony, you acknowledge that you had viewed this Zapruder film, on at least one occasion, if not more?

Dr. BADEN. Yes, the panel had many occasions to view the Zapruder film in slow motion and by individual frames. We were very concerned about seeing the film to better interpret the autopsy findings.

Mr. DODD. When I ask you this, I recognize you are not a ballistics expert and you are not testifying as to the ballistic evidence, but as a matter of medical evidence, in light of the fact that you have viewed the Zapruder film, can you state it as a medical certainty, that there were no shots fired from the grassy knoll which could have struck either Governor Connally or President Kennedy?

Dr. BADEN. Yes, sir. If I can take into account the autopsy findings, as well as the Zapruder film.

Mr. DODD. That is what I am asking.

Dr. BADEN. I can state for the majority of the panel, and Dr. Wecht will have his own opinions that he will explain to you, that there is no evidence beyond a reasonable degree of medical certainty, for any bullet to have struck the President from the front or the side. That the only bullets that struck the President are two from behind.

We studied the Zapruder film relative to the motion of the head. Suffice it to say, in all our experiences, among the more than 100,000 autopsies that the nine of us have had responsibility for, none of us have ever seen somebody shot in person or on camera to permit study of head motion. That is unique. The uniqueness is certainly undercut by the fact that it then happened on television 2 days later with Mr. Ruby. Apart from those two instances, and an occasional wartime film clip, it is unique to see a person's reaction to a gunshot wound. We cannot say with all of our experiences with gunshot wounds, what movement a head should have when struck, a live head, a live breathing head with blood going through, with the skin alive and the bones alive. How such a real head would react to a gunshot wound is beyond the limits of scientific study and recorded in the annals of medical literature, nor in the experience of the panel members. We cannot say with any degree of medical certainty precisely how we would expect the President's head to move when shot.

Chairman STOKES. Time of the gentleman has expired.

Mr. DODD. Thank you, Mr. Chairman.

Chairman STOKES. The gentleman from Connecticut, Mr. McKinney.

Mr. MCKINNEY. Doctor, it seems to me that we have an underlying problem. One of the reasons used as a conclusion of one bullet theory and these two men being shot was that no other bullet was found. But, we also have not found the bullet that struck the President's head. But it seems to me that there has always been this one basic problem, could the bullet have done the damage? You have explained that pretty well. But I think one area where we have question is, is there no way that the panel could have found out more to indicate whether or not the President's spinal column was hit by the bullet going through the throat?

In essence if it had been hit, then it would be pretty difficult for that bullet to have proceeded ahead, wouldn't it?

Dr. BADEN. It would have had a significant effect certainly if the spine were hit. I would say, to begin with, that the panel members were satisfied that the two fragments of the bullet found in the limousine were consistent with having caused the injury to the President's head. So the head bullet wounds I think are accounted for.

Mr. MCKINNEY. How much of that bullet was found?

Dr. BADEN. A great proportion of it, a large proportion of it. That is beyond the pathology panel's work.

Mr. MCKINNEY. It is fairly safe to say that bullet was fairly well destroyed by—

Dr. BADEN. Well, it was very much damaged but two major fragments were recovered.

Mr. MCKINNEY. And yet here we have another bullet that went through the neck, went through the chest, rubbed up against a rib, shattered a wrist, and went into the thigh, and stayed relatively—

Dr. BADEN. Intact.

Mr. MCKINNEY. In one piece.

Dr. BADEN. Going through soft tissues, skin and muscle, does not deform a bullet. It may slow it down but doesn't deform it. It is

bone that causes the deformation and skull bone is a very hard bone. The spine bone is also hard.

Forensic pathologists who deal with gunshot wounds frequently are very careful to dissect out the tracks of bullets to identify all of the injuries caused by the bullet; even if this would not change the final cause of death, we can anticipate that it will answer questions that might arise later. It is important for us to know, and we don't know, whether the bullet that went from the President's back through the neck, tore any major vessels in the neck. It may have. If so, this wound in and of itself could have been fatal.

The question you raise has multiple implications because, if the bullet struck the spine, this would cause some damage to the bullet and it would also probably cause damage to the spinal cord. Such injury has certain implication as to how the President would move his extremities, and as to the possibility of survival. The track wasn't dissected out. We have to speculate from other sources of information.

One of the reasons we spent so much attention to the possibility of a metal fragment in the side of the neck earlier, was because if it were a piece of bullet in the side of the neck, it would indicate the bullet struck bone. This would have an effect on the bullet as well as on the body. The majority of the panel members are satisfied that it did not strike bone at that point. The missile did create a cavity. The cavity, the bullet missile cavity, created by the bullet at this speed, causes damage much beyond the missile itself. It can cause damage to the spine, even if the spine is a couple of inches away from the bullet. We can speculate as to what it did strike, but there is no evidence from the X-rays, from the trajectory through the body, that it struck any substantial amount of bone. It might have struck the transverse process of the first thoracic vertebra but we cannot prove this.

Mr. MCKINNEY. That can't be proved one way or the other?

Dr. BADEN. That can't be definitely proved. Even if it had struck the transverse process it did not fragment or break up or leave any metal fragments, as a result of it.

Mr. MCKINNEY. I have just one last question to clarify for the American people, who have been watching us, we showed them in the Martin Luther King case a bullet that had struck the spinal column and was totally demolished. The projectile was flattened. I thought perhaps we ought to have, though you aren't a ballistics expert, your opinion as to what the difference was between those bullets?

Dr. BADEN. Yes, sir. I think it is an interesting comparison because both gentlemen were struck by high velocity rifle bullets as opposed to hand gun bullets commonly seen in the civilian population. A .30-06 rifle bullet struck Dr. King. However, the bullet injuring Dr. King struck two very hard bones, the mandible or jawbone, and the main portion or body of the vertebra itself, which is very thick. The question we have relative to the President's death was whether the bullet struck the tip of the lateral transverse projection of the spine, which is a thin area of the spine bone.

In the death of Martin Luther King, the bullet not only went through the very hard jawbone but it then went through the body,

the bulk of the spine, and may have struck more than one of the vertebra; in such an instance the damage to the bullet is very great. There is one other very important factor, the Martin Luther King bullet was a soft-nosed bullet, it was not fully jacketed, and so it would have a much greater tendency to break up.

Contrariwise, the bullet that struck the President, a 6.5 mm Mannlicher-Carcano is completely jacketed and it did, in the judgment of the majority of the panel, what the Geneva Convention wanted it to do: it went through the body without breaking apart, and it will do that if it doesn't strike very dense bone.

Chairman STOKES. Time of the gentleman has expired.

The gentleman from Indiana, Mr. Fithian.

Mr. FITHIAN. Thank you, Mr. Chairman.

Dr. Baden, I want to make sure I understood you correctly, then I have one question about bullet fragments.

There is no evidence that the injury to the President's neck and back wound left any bullet fragment. There was to the head wound.

What about the Connally back and chest wounds?

Dr. BADEN. As best as we can determine from interviews with the doctors at Parkland Hospital and in reviewing the X-rays available, the bullet did cause fractures to the fifth rib. There is division within the panel as to whether the bullet struck the rib directly or whether the fractures were caused by the cavity created by the bullet.

There is no evidence of any metal fragments left in the chest of Governor Connally by X-ray or on examination of the materials that were removed at the time of the operations.

Mr. FITHIAN. And the thigh wound of the Governor?

Dr. BADEN. There is a tiny pin-head sized object in the thigh wound of the Governor which we did interpret as a metal object, a fragment of metal, very pin head size perhaps.

Mr. FITHIAN. Was it recovered?

Dr. BADEN. That was not recovered.

Mr. FITHIAN. And the wrist?

Dr. BADEN. Do you have the wrist X-ray of Governor Connally?

The wrist was explored and operated on, and recovered from the wrist was some cloth fabric which matched the jacket of Connally. Thank you.

And the largest of those metal fragments, I think there are three fragments that are visible from this distance, overlay the distal radius near the wrist—the largest of those three fragments was removed by the surgeons in the course of their operation and preserved, kept at the Archives and made available to the committee many years later.

Mr. FITHIAN. The other fragments were not removed?

Dr. BADEN. The other fragments were not removed and are still present as demonstrated on subsequent X-rays available to the committee when the Governor's arm was healing.

Mr. FITHIAN. And is there no way that you could estimate the weight of that bullet fragment which remained in the Governor's wrist?

Dr. BADEN. The panel members felt that we could not, to any reasonable degree of scientific certainty, estimate precisely how



much of the bullet mass was represented by these fragments. However, it was the opinion of the majority of the panel that the amount of metal fragments in the President and the Governor was quite small, and taking everything into consideration, was entirely consistent with coming from bullet CE-399.

Mr. FITHIAN. One final question, Mr. Chairman. The statement that you made of the drawing that you used of the President's brain clarified a lot as to which side was damaged and that the cerebellum was not damaged. There has been some controversy about foreign material showing up in the photos of the brain. Did you look into that and, if so, what were your conclusions?

Dr. BADEN. Yes; we did. In fact, we were very concerned about the brain because of the lack of full and thorough examination of the brain at the time of autopsy. Some experts who had previously looked at the photographs of the brain, from which this diagram was made, did note a dark object within the bullet track.

This diagram was not made for the purpose of illustrating that object. But on all of the photographs of the top of the brain and in the transparencies and the negatives, approximately in this area where I am pointing, in the front right side of the brain, there is an oblong area of blue discoloration.

It was the opinion of the panel, after giving a great deal of consideration to this area on the photographs, and after discussing the X-rays with radiologists—the X-rays of the head were taken prior to removal of the brain—that without question it is not a metal object. It is the opinion of the panel, further, after studying the photographs of the undersurface of the brain, that that area of discoloration is most probably caused by blood vessels on the undersurface of the brain that have been exposed because of the damage to the top of the brain.

We feel it is not foreign material and that it is most probably blood vessels and thin membrane that have been sheered away by the bullet damage.

There is, incidentally, in the actual photograph what appears to be small toothpick-like objects, used to illustrate certain points and placed there by the doctors taking the pictures; that is not at issue. That is foreign material added for purposes of picture taking.

Chairman STOKES. Time of the gentlemen has expired.

The gentleman from Pennsylvania, Mr. Edgar.

Mr. EDGAR. Thank you, Mr. Chairman.

I have just one question with three exhibits that I would like to have put up JFK exhibit F-66, JFK exhibit F-20, and JFK exhibit F-46. Could those three exhibits be put up?

This question may be one, Dr. Baden, that we have gone over perhaps too many times, but I think it would be helpful for a person like myself who is not familiar with damage of gunshot wounds. I would like to draw your attention to the three exhibits and ask a question.

Is it your testimony that it is not unusual that a similar bullet shot from the same rifle traveling at the same speed, when it hits the objects, could in the one instance of the skull fracture, entering the back right side and blowing out a good portion of the upper part of the brain, not cause the same kind of explosive activity as it enters the back and goes through the throat, regardless of whether

it hits any other objects, or any other people? Is your experience that the same kind of bullet fired from the same kind of weapon could cause those two different results on exit?

Dr. BADEN. Yes, sir. As I have said, even with machinegun bullets rapidly fired, many different injury patterns will result in great measure dependent upon how the bullets strike. This bullet struck in a partially tangential manner against the skull bone. After striking the bone and yawing and tumbling and turning and exiting the missile produced an explosive effect causing skull bone and brain to burst outward, as seen in the Zapruder film. That is the transfer of energy can be different relative to the closed cranial cavity and the brain than when it goes through nonenclosed soft tissue. A bullet striking skin over bone produces different effects on the skin than a bullet striking skin that does not overlay bone. Every difference is reflected in the tissue injury produced.

It is of interest, and it is the firm opinion of the panel, that when the bullet exited Governor Connally's chest beneath the nipple, it produced a 2-inch diameter (5 centimeter diameter) round ragged hole while the same bullet only produced a small, narrow hole in exiting the neck of the President.

The extent of injury produced depends on what the bullet strikes, how fast it is traveling, to what extent the bullet is yawing, whether it strikes bone or not. Taking all these things into consideration, it was the view of the panel that it was entirely consistent for the same type of bullet to cause this explosive injury to the skull and brain and a relatively little in the way of injury to a soft tissue when it struck the back and exited the neck.

Mr. EDGAR. Thank you, I have no further questions, Mr. Chairman.

Chairman STOKES. The time of the gentleman has expired.

The gentleman from Michigan, Mr. Sawyer.

Mr. SAWYER. Doctor, I heard you mention, and I am sure you have, that you watched the Zapruder film a number of times.

Dr. BADEN. Yes, sir.

Mr. SAWYER. I have seen it a couple of times myself. And did you observe the pause, the very definite delay in reaction between when the President was lifting his hands to his throat before there was any observable reaction in the film on the part of Governor Connally?

Dr. BADEN. Yes, sir.

Mr. SAWYER. And you apparently discount that as being anything?

Dr. BADEN. It isn't, sir, that we discounted it. We did incorporate those observations, with all the other many observations, into a final conclusion.

I have the greatest respect for Mr. Groden and the work he has done, and the work the other photographers have done, to permit fuller appreciation of the Zapruder film and other films.

The problem that we, as physicians, have is there is no way to compare how people react to fatal gunshot injury. There often is delay time between an injury and a person manifesting the effects of such injury, very much like touching a hot pot on a stove. Some people react immediately and other people don't realize for a second or so that they have been injured. A second is approximate-

ly 16 frames of the Zapruder film. The type of injury that may damage the spinal cord area perhaps by shock waves if not by direct impact by the bullets might produce a certain automatic rapid reflex action while a bullet striking the chest may not produce an immediate reaction.

Mr. SAWYER. Do you observe, too, in that film though, while the President was visibly reacting and the Governor was at least not, to my ability to observe, showing any reaction as yet, he was still holding in his right hand his hat and that wrist was supposedly shattered by that bullet.

Does that disturb you at all?

Dr. BADEN. I think disturb is probably an accurate phrase. Yes; it causes me concern. However, the problem is clearly—

Mr. SAWYER. Aside from concern, how can a man be still holding the hat when his wrist is shattered?

Dr. BADEN. Although it appears incongruent clearly we of the panel have all had experience in which persons have been seriously injured and have not known they were injured for a few minutes. In evaluating all of the evidence, there is no question that Governor Connally did, in fact, hold his hat after he was shot, and after the bullet passed through his wrist—this would be the case even if one did not accept the “single bullet theory.”

He did hold that hat after the wrist was injured and he didn't know the wrist was injured.

Mr. SAWYER. The wrist should have known it, you would think.

Dr. BADEN. The wrist knew. The bone was broken. The greatest effect would have been on the nerves going to the muscles. If a nerve is injured this would produce a quicker response than if a nerve weren't injured. That is why, if the bullet injured the President's spinal nerves in the neck area, which is rich with nerves, a reflex, rapid reaction might ensue whereas, if the bullet goes through an arm there may be little visible response. We have had experience with many decedents who were unaware that they had been stabbed, shot who may run around and who were shot and then ran around the block before collapsing and dying. And I think whatever way Governor Connally was struck, he did, in fact, hold onto his hat. He did, in fact, not know that his wrist was injured after he was shot and it is not in our experience, investigation, unusual although it doesn't sound right but, in fact, people may be significantly injured and may have broken bones and may continue walking, continue holding a hat and not know it.

Mr. SAWYER. And now, when you combine that with what I thought was a very persuasive and impressive testimony of both Governor Connally and Mrs. Connally, adding that to it, you still feel that does not militate against your single bullet theory?

Dr. BADEN. The experience of all of us in forensic pathology and of many in criminal justice, is that, unfortunately, as much as I am impressed with Governor Connally's testimony and his ability to recall and his ability to survive what happened to him, as a forensic pathologist, I have learned not to rely on eyewitnesses or on persons who were present or who were injured in the course of a homicide, particularly when this comes into conflict with autopsy findings.

The panel did incorporate into our discussions Governor Connally's very persuasive testimony to the Warren Commission and otherwise, and Mrs. Connally's remembrance of what happened. Taking all of this into account, it is still strongly our opinion that one bullet and only one bullet went through Governor Connally. It is our opinion that one bullet and only one bullet went through the back of the neck of President Kennedy, clearly from all the evidence.

Taking all factors into consideration, it is also our opinion that it is the same bullet that went through the President and the Governor because there is no other evidence for another bullet in part. I think that Governor Connally's testimony is certainly important, but it would not be the first time that a person receiving an injury misperceives what happened at that precise instant.

Mr. SAWYER. Is it then a fair statement to say, or is it unfair to say, that you are basing your affirmative conclusion on the absence of evidence to the contrary; is that right?

Dr. BADEN. That is so in part; part of the affirmative conclusion, part of the single bullet concept incorporates all the consistencies; all the evidence is certainly consistent with a single bullet, but this conclusion becomes more persuasive because of absence of any reasonable alternative of any scientific merit apart from speculation. It is possible, it is within the realm of possibility to me but very unlikely, that a second bullet could have done damage lined up just as the first bullet. There is no evidence for it, and we are persuaded beyond a reasonable medical certainty against this speculation.

Mr. SAWYER. Thank you, Mr. Chairman.

Chairman STOKES. The time of the gentleman is expired.

Dr. Baden, at the conclusion of any witness testimony before this committee, under the rules of this committee, that witness is entitled to 5 minutes in which to explain or to expand upon or amplify any portion of his testimony, and I would, at this time, extend to you 5 minutes if you so desire.

Dr. BADEN. Thank you, Mr. Chairman.

Knowing the time constraints of the committee, I will not take the 5 minutes. But I would just like to comment that there are nine members of this panel who have contributed a great deal of time and effort, in addition to their normal duties in the nine jurisdictions from whence they arise, who spent this time because they feel that forensic pathology provides a unique expertise to assist investigation of violent and unnatural death.

I would also like to place on the record that, although I may be spokesperson at this point for the majority of the panel, that much more work was done by many other panel members than myself in many areas; and that each each of the panel members, even though we may not all agree on every point, have put in much personal time and have come, each of us, independently and collectively to the conclusions I have outlined to the best of our individual abilities.

Thank you very much.

Chairman STOKES. Thank you.