Significance of the history in the diagnosis of traumatic injury to children

Howland Award Address

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PRESIDENT Alexander, Dr. Silverman, members of the Society, and guests: First, let me tell you Hattie Alexander, long-time friend and one-time colleague, that I am delighted to receive the Howland Medal and Award from your gracious hands, and this special treat makes the ceremony doubly precious.

Second, I want to congratulate Fred Silverman on the completion of an exceptionally difficult chore. You started, Fred, with a drab subject and scanty material, and have fashioned them into a glowing career—one I would have been proud to have lived. Perhaps, I can achieve some of your magnanimous descriptions in the next life. I thank you, good friend, for the generosity of your sentiments and your deft words—certainly seldom, if ever, has so much been made of so little, so eloquently.

To the Society and its Councillors, I express my profound appreciation for the high honor you have bestowed upon me—this fourteenth Medal and Award which do honor to the memory of John Howland. This lecture is basically a tribute to the memory of this early master pediatrician—clinician, teacher, investigator, and organizer—whose words and deeds, one-half century ago, revolutionized pediatrics in the United States and Canada; he expanded the then narrow field of pediatrics incredibly, by his vigorous application of scientific principles in research and practice, to the broad specialty which we enjoy today. In the first Howland lecture, Dr. Edwards A. Park described Dr. Abraham Jacobi as the pioneer pediatrician of the United States; Dr. Emmet Holt as the founder of our specialty; and Dr. John Howland as the creator of modern pediatrics. Dr. Park's lively account of John Howland and his fruitful works is a most informative and entertaining story.

When I consider the illustrious thirteen Howland laureates who have preceded me, I am overwhelmed with misgivings as to my own fitness to join such a lofty congregation. Moreover, I know that there is no way under the Sun by which the Councillors could measure accurately my contributions to pediatrics and then compare them satisfactorily with those of my contemporaries. It is obvious that the line between success and failure, in winning this award, is a very fine one indeed. These facts give rise to the nagging suspicion that this fourteenth award might well have gone to a couple of other fellows.

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The Howland award has become, in my mind, a salute to all of the pediatricians of my day who have made contributions to this specialty, as well as the election of a single lucky winner. In my own case, I am sure the award represents, in large part, a recognition of the great advances in pediatric radiology during the last 30 years, in which I have had the good fortune to play one of the pioneer roles. Actually, I have spent a substantial part of my life, recording the important works of others, in the text, *Pediatric X-ray Diagnosis.*

But, I must not appear to be over-modest in this ceremony which is, by its very nature, immodest; because, overdone, it might lead you to discover that your 1965 Medalist is a man who has a great deal to be modest about. Rather, I prefer the outlook of Dr. Ben Johnson who after being paid a handsome, but extravagant, compliment by his King was asked how he replied to the King and whether he had tried to soften the compliment. Dr. Johnson is reputed to have said, "The King said it, I did not reply to him, no sir, when the King said it, it had to be so. It was not for me to bandy civilities with my Sovereign." So who am I to bandy courtesies with the august American Pediatric Society and its learned Council. No sir, they have spoken and I am delighted to abide by the wisdom of their judgment.

In the teamwork, which is essential in academic medicine, all of us are frequently aided—we must be aided if we are to succeed—by many associates at various stages in our careers. It is a pleasure for me to acknowledge the great debt I owe to the several members of my own laboratory at Babies Hospital for their loyalty, generosity of time, technical excellence, and kindly handling of thousands of small patients, many of whom were exhausted by disease and frightened by the seeming horrors of radiographic examination. Limitation of time permits me to name only two of these associates—the late Edgar Watts, master technician, and the cheerful Moira Shannon, department supervisor. This grand pair saved me literally thousands of hours, and lightened my burdens daily during many years by their faithful and skillful labors.

Two long-time friends were indispensable to my career, especially at its inception and then for more than two decades, namely Rustin MacIntosh, Carpentier Professor of Pediatrics, College of Physicians and Surgeons, Columbia University, and Director of Babies Hospital in New York City; and Ross Golden, Professor of Radiology, Columbia University, and Director of Radiology, Columbia–Presbyterian Medical Center. Their support was immediate, unwavering, and unstinted. Without their enthusiastic help I could never have even started. I will not embarrass Rusty, who is in this room, with a recital of his many sterling qualities which we all benefited from at Babies Hospital. He set high standards of excellence for himself and stimulated all of us to develop our full potential. He was a most talented and stimulating teacher. Few, if any, of pediatricians known to me had his intelligent broad outlook on life and medicine. He was a master reviewer of manuscripts and a magician with a blue pencil. Above all, this multitalented man never took himself too seriously and it was difficult for others to do so in his presence. This has all been recorded in the lively and intimate monograph, *The MacIntosh Era at the Babies Hospital,* by Douglas Damrosch.

It is still a wonder to me that Ross Golden welcomed me, a pediatrician without either formal or informal training or experience in radiology, into his department of traditionally and highly trained expert radiologists. Also, Dr. Golden had spent many years in increasing the qualifications for the Board of Radiology. In retrospect, it seems unlikely that a radiologic tyro of my stripe would have been permitted to darken the doors of any other Grade A radiologic department in the United States at the time. I feel sure that it could have happened only at the Columbia–Presbyterian Medical Center under the friendly and stimulating sponsorship of Rustin MacIntosh and Ross Golden, both wise men of great good will.

My greatest satisfactions have come from

the professional growth and development of several younger colleagues who helped me so much while they were learning pediatric radiology at the Babies Hospital. Time permits me to name but two—my first two residents, Frederic N. Silverman and Bertram R. Girdany. Each has created and then developed an outstanding department of pediatric radiology and teaching clinic at the Children's Hospitals of Cincinnati and Pittsburgh, respectively. Both Silverman and Girdany were first introduced to the radiographic aspects of trauma to growing bones, during their residencies at Babies Hospital. I well remember that the first batches of films which they sent back to me after leaving New York, including several fine examples of traumatic changes in the growing skeleton. Their many substantial contributions to radiologic pediatrics are, I am sure, known to many of you. Fred has special talents as a teacher and has literally stumped the United States on speaking tours in the interest of better Pediatric Radiology, at great expense of his own time. Dr. Silverman will shortly embark on an exciting teaching venture, during a sabbatical leave of 6 months, when, by invitation, he will travel the length and breadth of Australia and New Zealand to discuss and demonstrate American methods in pediatric radiology. Dr. Girdany has devoted much of the last 5 years to the study of the application of the television (Orthicon) camera and the electromagnetic tape to the recording of fluoroscopic radiographic images. The television equipment in his department roughly is the equivalent of that in two small television broadcasting stations. His work has progressed to the level now that he can record the continuous fluoroscopy for 6 to 8 minutes with the same tiny amounts of radiation involved in taking one standard film. His research already has made possible continuous study for several minutes, without hazard to the patient of radiation injury, of the fast movements in the organs of speech, the alimentary tract, and heart, lungs, and urinary tract. His techniques have already revolutionized the recording of fluoroscopy, and are already being used in many hospitals and even in some private offices. During this year, Dr. Girdany has given or will give lectures, by invitation, in Holland, Germany, and Italy. One of Dr. Girdany's associates at the Children's Hospital of Pittsburgh, Dr. Donald Darling, wrote a comprehensive text on techniques in pediatric radiology and, in it, he warmed my heart by pointing out that many of the best technical features originated with my one-time master technician, Edgar Watts, at the Babies Hospital in New York City.

The writings of Dr. Edwards A. Park have been one of the dominant influences in my professional career. It is doubtful if I would have had any initial interest in radiology had it not been for his beautifully clear descriptions of the microscopic and radiographic changes in the "transverse line," bone syphilis, rickets, scurvy, lead lines, and leukemia. Dr. Park will never realize how valuable his lectures and writings have been to me and I can never repay him for his splendid contributions.

Today, I shall discuss the significance of the history in the diagnosis of traumatic injury to children. You may be wondering why there should be any difficulty in identifying injury to children because, ordinarily, the traumatic episode is known to the parent or to others and the diagnosis is self-evident. The positive history is usually brought to the doctor and freely given to him by the parent or other caretakers—in pediatrics, by the mother customarily. The remarkable and too little known fact to pediatricians is that the history of injury to smaller children is frequently withheld by their parents and others, deliberately in some cases and inadvertently in many others, when the informant is unaware that the child has been injured. The important question then arises—how carefully does the pediatrician question the mother about trauma when it has not been offered to him voluntarily? My own experience indicates, from my own practice and from talking with pediatricians in active practice, that the question of trauma is rarely raised by the doctor unless the mother

offers it spontaneously. The pediatrician supposes that he will be given the full and honest history about all aspects of the child, including trauma, and he passes it by unless it is presented to him voluntarily. This erroneous supposition by the physician is one of the important deterrents to early, accurate diagnosis of infantile and juvenile injuries and abuse. Physicians should always keep in mind that there are many reasons and motives, both good and bad, which prevent parents from telling the whole truth about injuries to their children even when they have either participated in the injury themselves or have observed it directly. Also, parents are usually totally ignorant of the traumatic episode if the child is injured when not in their care. The doctor must also remember that older children who have been injured often do not mention or even deny trauma in the interest of avoiding punishment, under circumstances which I will explain later.

When the history of trauma is lacking, how reliable are the signs of trauma in the physical examination? The usual physical signs of moderate trauma include such findings as tender swellings, with or without localized tenderness and discoloration of skin, limitation of motion of the injured parts, and, sometimes, increased local heat. The swellings may be single or multiple and, in the case of repeated injuries, the swellings are found in different stages of evolution and involution. When the history of injury is clear, these signs are immediately attributed to injury by the doctor, without question. However, these same clinical signs, in the absence of history of injury, become deep diagnostic puzzles for they raise the question of all of the nontraumatic diseases which produce such physical signs (such as hemorrhagic disease, collagen disease, leukemia and lymphoblastoma, neoplasms, low-grade inflammations, scurvy, infantile cortical hyperostosis, and many others). Fever is common after internal bleeding and, falsely, this may suggest infections. Convulsions which follow known injury are immediately attributed to subdural hematoma or cerebral laceration but the same convulsions, in the absence of history of injury, suggest first brain tumor or, in the case of associated fever, some kind of meningoencephalitis. One can only conclude that the physical signs of trauma are not diagnostic and are usually misleading in the absence of the history of trauma. Usually they lead only to elaborate laboratory investigations which yield diagnostic information of negative value.

So far as I know, there are no laboratory findings which specifically identify traumatic lesions. Many laboratory findings, of course, are of great value in exclusion of other diseases or the identification of other diseases. The traumatic origin of blood in the cerebrospinal fluid, the pleural, peritoneal, and pericardial fluids, nasal discharge, sputum, urine, or feces is obvious with a history of trauma; the same findings, however, in the absence of history of trauma, are not diagnostic of trauma but raise the question of other causes. Biopsy specimens taken from traumatic lesions have only negative diagnostic value. Biopsy specimens taken from growing bones have been misleading in some cases of trauma because the presence of substantial amounts of mitotic figures have suggested neoplasm, rather than trauma, to the microscopist. Laboratory findings give little or no help in the positive identification of trauma.

A fourth source of evidence of trauma may be obtained from radiographic examination. If one believes, as I do, that radiography is merely internal inspection, this finding might be included under the physical examination. In most tissues of the body, radiologic findings do not differentiate traumatic changes from nontraumatic ones. The great exceptions to this statement are growing bones, which, when traumatized, may disclose conclusive evidence of the trauma in the absence of fractures and dislocations. Basically, there are two radiographic findings in growing bone, which, when present together, are pathognomonic of traumatic injury. These are the metaphyseal infractions, the chip fractures, the chip fracture fragments at the ends of the shafts, and the long traumatic involucrums which cloak the

shafts. I have described and discussed these lesions in detail in the MacKenzie Davidson Memorial Lecture in 1956 and will not repeat them here, but I will now show some of them and their relation to the presence or absence of history of trauma in a series of lantern slides. (Some 26 lantern slides were shown and discussed at this point, each of which demonstrated the radiographic lesions of trauma and the motives for withholding trauma from the history by parents and by older children.) The metaphyseal infractions have special diagnostic value because they appear immediately and are, therefore, immediately diagnostic when early films are made. The traumatic involucrums, on the other hand, usually do not appear before the eighth or the tenth day after the injury. They have the special diagnostic value, however, when they are present in different stages of development, and indicate recurrent traumatic episodes or multiple beatings of the child.

The presence of these metaphyseal infractions and traumatic involucrums in otherwise normal bones are diagnostic of trauma in themselves, even in the absence of history of trauma. Their presence always warrants a searching inquiry for trauma by the pediatrician. Often, parents who have intentionally withheld the history of trauma, will, when confronted by this radiographic evidence, tell the truth. When parents so confronted do not tell the true story, the mere knowledge that trauma has been suspected by the physician is a restraining force against further trauma. It behooves the pediatrician to suspect trauma in all cases in which painful swellings and like signs cannot be explained satisfactorily and to order appropriate radiographic examinations of the bones before elaborate other investigations are begun. It is best to order films of the complete skeleton for optimal diagnostic results. It cannot be emphasized too strongly, however, that even classical radiographic changes of trauma in the bones, tell nothing of the person who abused the child or how it was abused. Radiographic changes alone, therefore, never warrant the accusation by the radiologist, pediatrician, or social worker that a specific person or persons are responsible for the injury. To do so might incur embarrassing and successful legal counteraction from the falsely accused. The radiologist, however, can always state with full confidence that the child has suffered from mechanical injury when these telltale radiographic changes are present, even in the absence of a history of trauma.

Another important deterrent to accurate diagnosis is the failure of parents and other caretakers of small children and the older children, themselves, to tell the physician the truth about the causation of injuries. There are several motives for this withholding of information—some good, some bad. Parents, one or both, who have wilfully abused children conceal the truth to protect themselves from legal punishment and disapporval by their neighbors; but keep in mind that sometimes only one parent is guilty; and the innocent parent, who may know nothing of the other's guilt, may be the physician's informant. Also the parents, one or both, in the case of purely accidental injury to their child (in which they are entirely innocent) may withhold the history of trauma from the physician and everyone else because of shame alone. They are ashamed because they did not prevent the accident. Such parents usually have an excellent record for truthfulness in every other respect. Then, of course, both parents may be totally ignorant of the traumatic episode when their child is abused by someone else, out of their presence, or when the child is injured accidentally in the same circumstances. Actually, anyone to whom the child has been exposed alone for even a few minutes may be the source of injury in such cases—especially members of the family such as visiting uncles and aunts, grandparents, cousins, and siblings. People, other than family members, who have easy access to children and/or their homes also have abused them (baby-sitters, nurses, nurse's aides, day nursery attendants, x-ray technicians, governesses, housemaids, cleaning women, handymen, delivery boys, repair men, "boy

friends" of older sisters and of the mother, and many others). Also, children have been seriously injured by pet animals and have withheld the information because they feared that the pet would be taken away. In one case, reported by the New York newspapers, a boy had been beaten up badly for failure to pay tribute to a neighborhood gang. In this case, the parents knew nothing about the cause of his injury. I have seen two examples of false accusation of innocent parents whose children had been injured at birth; the residual radiographic changes in the bones 2 or 3 months later were misinterpreted as acquired lesions caused by the parents. When children are insensitive to pain, serious injury can also occur without the parents' knowledge. There are many circumstances in which the parents are totally ignorant of the cause of their child's injury and in which they do not and cannot give a history. The failure of the parent to give a history of injury is, therefore, not necessarily proof that the parent has wilfully inflicted injury on the child. The term "battered child" is so often misleading. It implies beating of the child and should be abandoned. The "maltreated" or "abused child" is preferable.

Older children can usually provide adequate history of their injuries if they care to, but often they do not care to because it is to their advantage to conceal it. This is usually the case when the child is carrying out some forbidden activity and does not want to tell about the injury because it incriminates him in the forbidden act, such as playing truant from school, playing football, bicycling in the streets, sledding in the streets, riding trucks, and many other forbidden activities. Older children have also withheld the real causes of their injuries to protect pet animals who have been directly or indirectly involved in the injury. This is done because they fear that, if the truth is told, the pet will be taken away. Occasionally an older child who has injured a younger child will attempt to shift the blame to a younger sibling and the same has been true for some parents. It is manifest that, on many occasions, in the case of injury to the older child, the parent will be innocent and totally ignorant of the nature and cause of the injury.

Children are injured for a great variety of reasons and the adults involved, usually parents, withhold the history of injury for a great variety of reasons—criminal guilt, innocent shame, and often because they are totally unaware of the child's injury. Everyone applauds the attempt to punish the sadistic repetitive child beater. My experience suggests that the relative number of the latter is smaller than is generally believed and most of these parents are either psychotic or alcoholic or both. The great majority of single, even serious, traumatic episodes to children are not due to parental abuse but are accidents for which no one is responsible. Thus, it is exceedingly difficult to write any law for compulsory reporting or compulsory investigation of injury to children which would not do injustice to many innocent parents and other caretakers of children. The mere accusation of being a child-beater is no proof at all that the individual parent is guilty, but the mere charge smears the accused wrongfully, sometimes permanently, before he is tried. One wonders why the newspapers, radio, and television present such warped coverage of this subject, in which they seem to glory in emphasizing the wilful infliction of injuries to children by their parents, with practically no mention of the possible innocence of the parents.

It is not fully appreciated that the line between an ordinary spanking and a serious injury or even fatal injury may be a very fine one indeed. Often, this difference is a matter of pure chance. Serious injuries are not necessarily caused by severe or malicious abuse by parents. We know that many children have been exposed to the most violent forces which should have injured them seriously or killed them, only to see them come through with only slight injury or no injury to the vital organs. Children have been beaten "black and blue," and have been hit by automobiles traveling at high speed and dragged for many yards with surprisingly little

injury. I saw the radiographs of a child, who reportedly had fallen from the eleventh floor of a New York apartment, whose most serious injury appeared to be a fracture of one fibula. On the other hand, children have developed severe subdural hematomas, often, after falls of only a short distance of only 2 or 3 feet. A child, after an ordinary slap or push by a parent, bent on only normal punishment, may be propelled against the sharp edge of a table or bed and this secondary injury which the parent did not intend may induce fatal laceration of the liver, spleen, or brain, or tear the communicating veins to produce fatal subdural bleeding. It is true that the use of reasonable and usually safe force in the punishment of a child by parents may produce unintentional secondary injuries which are serious and, sometimes, fatal; and the innocent parent may suddenly find himself in the toils of the law charged with mayhem or even murder when he actually set out to correct the child by moderate or mild punishment. All of us, who have ever punished a child vigorously and are eager to condemn parents before a fair trial, should remember the old adage—"There, but for the grace of God stand I."

The facts in this problem of trauma seem very clear to me. Trauma, the greatest killer and crippler of children, has been neglected by everyone including pediatricians. We need deep and sustained studies of this problem. It is unlikely that the legal compulsion of physicians to report injuries will aid very much in the solution of the problem. It seems to me, in view of the importance of this subject, that every well-developed pediatric clinic and hospital should have at least one physician who devotes most or all of his time to the study and care of injured children, from a social and epidemiologic standpoint as well as a therapeutic standpoint. We need better diagnostic techniques for the identification of traumatic injury to children, especially when the skeleton is not affected. In one's imagination at least, it seems possible that, after injury, such substances as myoglobin or catabolic products at the site of injury might be found in the urine or the serum in excessive amounts. It is to be hoped that the biochemists can enter this field and, perhaps, provide diagnostic tests that are much better than anything we have now. Perhaps a new and independent subspecialty will appear, pediatric traumatology. It is hoped that the pediatric traumatologist can take his place with the other pediatric subspecialists. Let us hope that one of them will have some of the vigor, ability, and intelligence of John Howland. In conclusion, I thank the Society sincerely for this handsome 1965 Howland Medal and Award. I am deeply grateful to you all for a thrilling day.

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