Transfixion of the Heart by Embedded Ice Pick Blade with Eight Months’ Survival

By Harry J. Lowen, M.D., Seymour A. Fink, M.D., and Milton Helpern, M.D.

A case is presented of a 24 year old Puerto Rican man whose heart was transfixed by the anterior end of an ice pick blade, with the posterior end of the blade fixed in the body of the sixth dorsal vertebra. The patient survived for eight months. Roentgenologically, the patient presented a problem in determination of the path of the foreign body. At autopsy, vegetations were found in the heart on the perforated mitral valve; these were the source of multiple embolizations.

REVIEW of the literature reveals many cases of penetrating wounds of the heart caused by a variety of objects. However, the percentage of these cases involving the auricle alone is small and of these latter the number with recorded electrocardiographic tracings is even less.

Middleton,1 in a review of the literature, could find only 4 cases with electrocardiograms2-4 and added one case of a stab wound of the right auricle (Case 2). There were also a few other reports published at this time. Harken and Zoll5 report a case of empyema due to injury by a shell fragment which, at operation, showed the empyema to communicate with a laceration in the pericardium and underlying adherent left auricle; the laceration of the auricle was plugged by a large infected intracardiac hematoma. Noth6 reported a case of stab wound of the left atrium (Case 18). Herve and Forero Sarabia7 published 5 cases of auricular wounds, with electrocardiograms summarized in a table, but only two reproduced. The electrocardiographic changes in these cases are not repeated here because they were not specific for auricular damage and were more suggestive of pericarditis than infarction.

The following case is reported because it is unique in that the foreign body was fixed while the pulsating heart moved constantly upon it.

CASE REPORT

R. A., a 24 year old Puerto Rican man, was admitted to the Urological Service of Harlem Hospital on February 5, 1947. His principal complaints were chills, fever, and pain in the left costovertebral angle radiating down to the left thigh, for the previous thirty-six hours. In addition, he had dysuria and noted the urine to be cloudy but had passed no stones.

Physical examination revealed a well developed and well nourished man who was acutely ill. The principal findings were exquisite tenderness in the left costovertebral angle, and tenderness in the left lower abdominal quadrant. The heart was regular with a rate of 60 and murmurs of moderate and identical intensity were heard throughout systole and diastole. In the upright position, these were heard loudest posteriorly at the level of the fourth and fifth thoracic vertebrae and equally on both sides in the interscapular area; and with the patient in the prone position, the murmurs were loudest on the right side at these same levels. Systolic and diastolic murmurs were also heard in the anterior axillary line at the level of the fifth intercostal space on the right side anteriorly and a rough systolic in addition to a long faint systolic was heard all over the left precordium. The urine on admission revealed a one plus albumin and a few white blood cells per high power field. The blood count showed 9,200 leukocytes with a differential of 70 per cent polymorphonuclear leukocytes, 28 per cent lymphocytes and 2 per cent monocytes. The hemoglobin was 70 per cent; the red blood cells 3,700,000. The diagnosis on admission was pyelonephritis.

Because of the cardiac murmurs, a medical consultation was called and a routine fluoroscopy revealed a slender metallic object pointing anteriorly from the mid-dorsal area in the region of the left auricle. On further questioning, the patient disclosed that he had been stabbed twice in the back with an ice pick about six months previously. Evidently, the handle of the ice pick had broken off, of which he was unaware, and the blade had remained within his thorax. After the accident he had presented himself at the emergency ward of a hospital where he refused to remain and signed himself out subsequently. There were two small scars visible on the back in the interscapular area, one near the spine of the left

From the Medical Service of Harlem Hospital, New York, N. Y., and the Office of the Chief Medical Examiner of New York City.
H. J. LOWEN, S. A. FINK, AND M. HELPERN

The scapula and the other just over the posterior end of the buried ice pick blade.

After a few days of bed rest, during which 40,000 units of penicillin were administered every three hours, the patient became asymptomatic. Several subsequent urine specimens revealed albumin and red blood cells. Smears of the urine revealed no organisms; on culture, gamma streptococcus and colon and paracolon bacilli were identified. An intravenous pyelogram was negative. Roentgenograms of the chest in posteroanterior and lateral positions were reported as showing "the presence of a linear, pointed, metallic foreign body, resembling an ice pick, located to the left of the spine between the eighth and ninth ribs, running posteroanteriorly and extending as far as the upper portion of the left auricle; it may extend through the thoracic aorta but there is no evidence of dilatation at this point." The instrument lay to the left of the seventh dorsal vertebra in a longitudinal plane pointing directly forwards. It had caused some bone production around it, indicating that it had penetrated the bone. A barium drink revealed displacement of the esophagus to the right at the level of the ice pick blade and it was the impression of the roentgenologist that it might have penetrated the aorta (fig. 1). The electrocardiograms (fig. 2) were interpreted as revealing a posterior wall myocardial infarction.

Eighteen days after admission, the patient developed a sudden onset of dizziness associated with inability to use the right upper and lower extremities. Neurologic examination revealed signs consistent with a right hemiplegia. The following morning a neurologic consultant diagnosed a right hemiparesis and, because the signs were transitory, cerebral embolism was considered the most likely cause.

On the fortieth day after admission, an angiocardiogram (fig. 3) was done by Dr. Sussman of Mount Sinai Hospital and his report was as follows: "Examination of the chest, including angiography, shows a metal spike which enters the left posterior chest immediately adjacent to the spine. In both the lateral and posterior-anterior views, the spike appears to pass through the descending aorta, the tip impinging in the region of the left auricle. It might, however, pass very close to the aorta, rather
Fig. 2.—Electrocardiograms of the patient.
than through it. The cardiac chambers and large vessels are not otherwise abnormal."

Subsequently, it was learned from the mother that although he was ambulatory, the patient had not been as active since the stabbing episode as previously and that he had developed increasing fatigue and shortness of breath.

At operation, a thoracotomy was done and be-

noted, one situated 2.5 cm. to the left and the other just to the right of the midline at about the level of the sixth dorsal vertebra. The pertinent necropsy findings were:

The structures in the peritoneal cavity appeared normal.

The right lung was firmly adherent to the chest wall, posteriorly and laterally, by old fibrous ad-

cause of considerable hemorrhage encountered it was deemed unwise to continue the procedure. The patient died four hours later.

**Necropsy**

Necropsy was performed fifteen hours post mortem. The body was that of a well nourished, well developed Negro, 157.5 cm. (5 ft. 3 in.) tall, scale weight 128 lbs. It was not possible to identify with certainty the scar marking the site of the stab wound which had been inflicted eight months previous. Two small 3 mm. sized pigmented scars were

lesions. The left lung was free and no fluid was found in the left pleural cavity.

The heart (fig. 4) was found free of adhesions in the pericardial sac. The latter was intact and contained only a few cc. of clear fluid. Although the heart was dilated, it was normal in configuration and weight (280 grams). On removal of the heart from the pericardial sac, the track of a small stab wound was found at about the midpoint of the posterior wall of the left atricle. Through a small perforation, 5 mm. in diameter, a broken off ice pick blade projected through the cavity of the auricle,
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transfixing it and the anterior leaflet of the mitral valve. The segment of the blade which was imbedded in the heart was 4 cm. in length; the base of the blade, measuring 4.3 cm., was firmly impacted in the left lateral position of the body of the sixth dorsal vertebra but did not enter the spinal canal. On perforations in the anterior leaflet of the mitral valve, one 9 mm. and the other 12 mm. in length, and each 4 mm. in width and 6 mm. apart. The point of the blade at the end of the track lay in the outflow tract of the left ventricle, just below the level of the undefended space. A slight amount of fibrous thick.

removal of the blade, no evidence of osteomyelitis was found. The weapon was directed forward and slightly medial. The blade, in penetrating the auricle, passed lateral to the aorta and esophagus and did not perforate either of those two structures. There was evidence of a localized injury to the adventitia of the aorta in the form of a small brownish gray scar adjacent to the site of the injury. Examination of the heart revealed two unhealed opening of the endocardium of the septum was noted at this point. In association with the perforations in the mitral valve there was a superimposed vegetative endocarditis in the form of broad masses of gray colored granular vegetations surrounding the two perforations on the auricular aspect of the anterior valve leaflet. The area covered by the vegetations was 4 cm. by 2.5 cm., the longer dimension extending up onto the interauricular septum where the bulk of

Fig. 4.—Photograph of opened heart, showing ice pick blade projecting from posterior wall of left auricle and punctures and endocarditis of mitral valve.
the vegetation was found. Only a few small vegetations were noted on the ventricular surface of the perforated valve leaflet. Surrounding the perforation in the posterior wall of the left auricle through which the ice pick blade protruded there was a small mass of friable thrombotic material measuring up to 4 mm. in thickness. The inflammatory process did not involve the posterior valve leaflet. The coronary arteries were not sclerosed and no occlusion of the larger branches could be demonstrated. In order to preserve this unusual specimen, it was thought too valuable to sacrifice the heart for microscopic studies and it was preserved as a museum specimen, and for this reason the coronaries were not completely dissected out. There was a circumscribed but not sharply demarcated zone of fibrosis, grayish white in color, replacing a portion of the myocardium in the posterior wall of the left ventricle, situated just to the left of the posterior interventricular sulcus. On section, this fibrous tissue replacement extended almost completely through the cardiac muscle, its over-all dimensions were 5.5 cm. in length and up to 4 cm. in width. It was evidently the fibrous replacement of an infarction. The remaining valves of the heart were normal and there was no evidence of prior inflammation of the injured mitral valve leaflet.

There was slight fibrous thickening of the areolar tissue of the posterior mediastinum surrounding the position of the impacted ice pick blade. There was no evidence that any phlegmonous posterior mediastinitis had existed.

Examination of the broken off blade following its removal revealed a fairly clean smooth surface and an unbroken sharp pointed blade, 7.8 cm. (3 1/4 inches) in length, the diameter of the shaft at the broken end being 3.5 mm.

The aorta throughout its length was smooth and elastic.

Both lungs were heavy, congested and edematous and on section were pale.

The liver was normal in size and on section was dry and pale, but the markings were normal; it weighed 1400 grams.

The spleen was not enlarged and was bound down by fibrous adherions. It weighed 100 grams, was flabby in consistency and contained several large circumscribed anemic infarcts which were yellow in color, firm and depressed. The largest infarct was 2 cm. by 2.5 cm. and up to 9 mm. in depth. The remainder of the splenic pulp was red in color and flabby.

The kidneys together weighed 240 grams and were about normal in size. Numerous, variable sized anemic infarcts, similar to those found in the spleen, were distributed over the surface of each kidney. These infarcts were circumscribed, yellow in color and depressed. They appeared of varying age and were up to 2.5 cm. in diameter. On section they revealed a characteristic wedge shape and exhibited evidence of organization. The uninvolved parenchyma was pale but otherwise presented normal markings. The pelvis and ureters were normal.

The bladder contained 60 cc. of pale urine.

All of the other organs in the body appeared normal.

The brain was removed; its surface was pale, the meninges were clear, and the arteries at the base were narrow and delicate. Sections revealed a recent anemic infarct, 6 by 9 mm., in the posterior half of the putamen. Several small areas of swelling and fresh infarction of the cerebral cortex were also found, including one in the left temporal lobe.

In addition to the above, the autopsy revealed evidence of considerable hemorrhage which had occurred during the operative procedure.

**DISCUSSION**

The symptoms which brought this patient to the hospital were referable to the kidneys. Because of the bizarre murmurs in various anterior and posterior locations, he was fluoroscoped immediately. It was then that the existence of the ice pick was discovered. Our first problem in this case was the exact location and path of the foreign body. The roentgenograms of the chest in the anterior, posterior and right lateral positions placed the anterior end of the pick in the region of the left auricle and suggested that the metallic object was fixed in the body of a dorsal vertebra. Because of the many important structures which are in posterior relation to the left auricle, it was necessary to ascertain whether any of these were also involved. The barium paste revealed the esophagus to be pushed slightly to the right, but did not help in definitely establishing whether there was any injury to the esophagus or aorta. The angiocardiogram indicated the proximity of the aorta to the weapon but did not establish whether that vessel was actually transfixied by it. Furthermore, it seemed unlikely that the aorta could have been perforated and not have resulted in serious hemorrhage.

Here was the unique instance of an ice pick wound of the thorax in which a large foreign body in the form of the blade of an ice pick was fixed within the body of a dorsal vertebra, the point projecting into the left auricle and transfixing the anterior leaflet of the mitral valve. The blade also grazed the left lateral surface of the aorta and esophagus without perforating these structures. Although the wounding had occurred six months before ad-
mission to the hospital, the patient did not complain of precordial pain, dyspnée or palpitation. It is remarkable that the heart maintained its normal rhythm and rate with a fixed metallic object piercing it and transfixing the left auricle and mitral valve.

When the episode of transitory hemiplegia occurred, cerebral embolism from a mural thrombosis of the injured left auricle was considered. Following the cerebral embolism the renal symptoms were presumed to have resulted from embolism from the same source. It was also possible that the left lumbar pain was partly associated with the splenic infarction. During the first two days after admission, the temperature ranged between 100 and 101 F., and thereafter the patient was afebrile except for one morning two months later when the temperature was 101 F. The presence of vegetative endocarditis was not suspected clinically and blood cultures were not taken. Petechiae were never seen.

Reasons for the removal of foreign bodies from the heart as summarized by Harken and Zoll are: (1) to prevent embolism of the foreign body or the development of thrombosis and resultant embolism, (2) to reduce danger of bacterial endocarditis, (3) to prevent recurrent pericardial effusions, (4) to reduce incidence of myocardial damage. Since this patient already had multiple embolization, surgical removal of the offending weapon was deemed wise.

The electrocardiographic changes encountered in traumatic wounds of the heart are in the main due to one or more of the following factors: (1) myocardial damage by the foreign body, (2) pericarditis, (3) injury to an important branch of a coronary artery. Noth has recently published an excellent article on the electrocardiogram in penetrating wounds of the heart; he reviewed the literature and presented 23 cases, some of which had been followed for periods of five to thirty-six months after injury. He stated that the electrocardiographic findings such as those of pericarditis, bundle branch block, or myocardial infarction may be accepted as definite evidences of cardiac involvement, whereas T-wave abnormalities and minor deviations of the RS-T segments cannot be relied upon as criteria of injury since they can also be caused by shock, anemia or displacement of the heart which are often present in thoracic wounds without cardiac involvement. The first electrocardiogram (fig. 2) revealed an elevated S-T1 with a small Q2 and deep inversion of T3. The high voltage of the T and R waves in the precordial leads are reciprocal to a posterior wall infarction. The subsequent tracings indicated a return of the S-T2 to the base line, inversion of T2, a deeper Q3 and a deeper coving of T3, all of which are progressive changes produced by a posterior wall infarct. In view of the fact that the coronary arteries showed no evident occlusive disease and the presence of other embolic phenomena, it is reasonable to conclude that the myocardial infarct was also embolic in origin. Although the pericardial cavity was traversed when the weapon entered the posterior wall of the left auricle, a pericarditis did not develop beyond the margin of the perforation. The presence of an infarct in the posterior wall of the left ventricle was confirmed at autopsy.

The ice pick could not be seen in the posteroanterior view in the chest x-ray films because in that view only the point was seen. Systolic and diastolic murmurs were heard over the entire precordium and also posteriorly in the interscapular area. The presence of both murmurs was shown on the phonocardiogram. Necropsy revealed that these murmurs were caused by two perforations in the anterior leaflet of the mitral valve. Despite the transfixion and perforations of the larger of its leaflets, the mitral valve continued to function and the patient did not manifest dyspnea or pulmonary congestion and, in fact, had no cardiac complaints.

**Summary**

An unusual case is reported of survival for eight months following an ice pick stab wound of the back in which the broken off blade remained impacted in the body of the sixth dorsal vertebra and transfixied the left auricle and anterior leaflet of the mitral valve. The disability was caused by the development of a vegetative endocarditis of the injured valve which produced multiple embolization of the
kidneys, spleen and brain. Death occurred following an unsuccessful attempt to remove the weapon surgically. Electrocardiographic studies revealed changes consistent with a posterior wall infarction which was confirmed at necropsy.

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REFERENCES

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