Decapitation of an agricultural worker by a combine harvester: a case report

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Abstract

Background. Each year, there are billions of agricultural work accidents involving the operation of tractors, grain augers, harvest combines, power take-off devices, or balers and thrashers. Field accidents of this nature seem more common on afternoons, just as road accidents tend to skew toward nighttime. The lesions can vary widely and depends strictly on the operation of the machinery analyzed.

Aims. This paper aims to present a peculiar case of decapitation by a combine harvester, showing how, in cases of injury due to agricultural machinery, it is fundamental a correct execution of a scene investigation, autopsic examination, and cooperation with a specialist in engineering.

Case Report. A 54-year-old man was found decapitated on the header of a combine harvester; his extremities were also dismembered. At autopsy, a clean oblique cut across the first cervical vertebra had severed the head at the neck. Although the right arm remained intact, both lower extremities were mutilated, showing numerous exposed and open fractures. A bleeding, penetrating wound to the back was additionally noted. In the days that followed, missing parts (head and left leg) were discovered in other machine components (grain tank and straw walker, respectively). All observed injuries were compatible with the mechanics of the cochlea, its rotating movement inflicting the damages above. Collaboration between pathologists and engineers was fundamental to recreating the dynamics of this rare decapitation accident by a combine harvester. Clin Ter 2023; 174 (5):386-389 doi: 10.7417/CT.2023.2454

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Case report

A 54-year-old white man was found decapitated in a wheat field, atop the header of a combine harvester (Fig. 1 A, B). His extremities were completely mangled as well. According to his son’s deposition, the worker had intended to finish the harvesting of wheat. One hour into the process, he was found decapitated and trapped between the cochlea and the cutterbar of the machine’s header.

His right elbow was flexed ~90 degrees, the foreman resting beneath his torso. The left upper limb was situated entirely under the trunk. Both legs were mixed with fragmented vegetation, wedged between the rollers, and the header was extensively covered in blood (Fig. 2 A).

Completely mangled remnants of the head and left leg were later retrieved from the grain tank and straw walker, respectively (Fig. 2 B).

Upon external examination, the head had been severed by an oblique cut across the first cervical vertebra. The cut was clean with infiltrated margins, likely inflicted by a sharp and highly kinetic blade. Soft tissues of the trachea and esophagus appeared fully transected. The right arm showed diffuse bruising but remained intact. There were numerous displaced and open fractures of the left arm. Both lower limbs were severely mutilated, reflecting the rotational force applied to the longitudinal body axis, and the left leg had been amputated. On the back, a penetrating wound with frayed edges and bleeding (Fig. 3 A, B).

Discussion

Each year, there are billions of agricultural work accidents. Related fatality rates for 2020, calculated in 16 countries (including USA and Gambia), range from 10.9-30.6 per 100,000 persons per year (1). Most of these deaths involved the operation of tractors (10.2-54.3%), grain augers (6.4-22%), harvest combines (8.6-16%), power take-off devices (5.4%), or balers and thrashers (3.9%) (2-3). Field accidents of this nature seem more common on afternoons (37.0%), just as road accidents tend to skew toward nighttime (44.4%).

A combine harvester is a sophisticated, self-propelled farm machine, with a header unit for crop cutting and a threshing unit to convey cut materials. A straw walker ultimately
Fig. 1 A. Figure A shows the front side of a combine harvester. B. The photo shows the back side of a combine harvester and specifically the gran tank and the straw walker.

Fig. 2 A. The figure shows the discovery of the corpse during the medico-legal inspection operations. B. Remnants of the head and left leg retrieved from the grain tank and straw walker.

Fig. 3 A. The head appears to be cut in an oblique plane passing through the first vertebra. B. On the back, a penetrating wound with blood leakage.
separates the chaff from clean grains, transporting the latter to a storage tank (4). Upper limb injuries typically occur as workers attempt to remove waste plant matter from lit machines. Using a stick is risky, because sudden inherent jerks may draw a farmer’s hand into the mechanism (5). Other implicit hazards, such as falling from a height or entanglement of body parts/clothing in moving machinery parts, are also described. Carelessness (38.3%) and inattentiveness/thoughtlessness (31.9%) are two principal causes, followed by loss of balance (12.8%), machinery blockage (12.8%), inappropriate clothing (2.1%) and mechanical problems (2.1%) (6-9). However, Khurram et al. have determined that inappropriate clothing (2.1%) and mechanical problems (12.8%), machinery blockage (12.8%), thoughtlessness (31.9%) are two principal causes, followed by loss of synchronization between those who move rollers and those who feed crops (10-11).

In work accidents, such as the presented case, the execution of the forensic medical inspection and the engineering study of the machinery becomes essential.

In the present case, the forensic examination was fundamental both for discovering the fragments of the body and for reconstructing the dynamics of the accident.

Regarding the search of body fragments, it was hypothesized that the head would have been found under the cutter bar because the concave (a perforated plate located under the threshing cylinder) only allows the passage of wheat grains (12-13). For this reason, it was assumed that the head and the soft tissues opposed an elastic resistance enough not to exceed the concave. Therefore, during the forensic examination, lifting the cutter bar was explicitly requested.

However, when the body’s remains were not found, the advice of an engineer was requested to direct the searches. Specifically, the study of the combined harvester model made it possible to understand the course that the body’s remains had made and, therefore, to concentrate research within the grain tank.

According to statistics, 65% of combine accidents are attributable to contact with processing parts, such as cutters, feeding chains, or conveyor belts, whereas 29% involve combine rollover (14-15). The cochlea itself is a sharp and rotating spiral bar that conveys crops to a feeder house at speeds of 152 rpm. Combines and corn pickers may thus tear, crush, or thermally injure the fingers, hands, and arms. Complex and grossly contaminated lacerations, severe friction burns, crush injuries with the fracturing of digits, major amputations, skin avulsions, and soft-tissue tears are characteristic in this setting (15-17). Despite the potential for devastating harm to entire upper extremities, studies suggest that sustained mutilations are usually confined to fingers and hands (18-21).

As for the reconstruction of the dynamics, it appears that the man had exited the cab of a lit harvester and lost his balance. Our reconstruction of the event indicates that his back hit a pointed element of the header, producing a wound. He then rolled off, falling into the cochlea.

During this event, the cochlea severed the neck in an oblique plane, decapitating the man through one fast rotation. His legs were consumed as well, the violent rotary action causing severe longitudinal axis mutilation. Similar accidents have been reported to date, but decapitation by combine harvester has yet to be described.

This powerful machine also destroyed all tissues of the skull, some assuming the path of maize grains, and the rest eliminated as waste. In a combine harvester, vegetation is conveyed into the threshing unit, which processes the material/grain mixture. Chaff goes to the cleaning unit, and straws are sent to the straw walker. The clean grain is carried to a storage tank, dumping straw and chaff refuse from the harvester (22-30).

This reconstruction was made possible with the help provided by the engineering study.

Specifically, analysis of the cervical lesion and the various components of the combine harvester allowed us to assert that the cochlea was the only element capable of causing an oblique and clean cut such as the one found. There are other cutting elements, such as the blades of the cutter bar but they could not have caused an injury like that.

After all, the blades of the cutter bar, by shape and size, are meant to convey grain through narrow spaces that a human head or neck can hardly access.

The study of the machinery revealed the deactivation of safety systems, precisely that of the “man on board.”

From a technical point of view, the driver’s seat should be equipped with a seat that includes a “man-on-board” sensor that results in the machine shutting down if the operator falls from the driver’s seat (which, however, should be prevented using belts) (31).

In the present case, therefore, it is likely that the worker deactivated the safety systems, performed an incongruous maneuver while attempting to get out of the cockpit, and fell inside the auger, which was still functioning.

**Conclusion**

Herein, we have detailed a rare case of decapitation and dismemberment by a combine harvester. According to our reconstruction, the operator fell onto the machine’s header, impaling his back on a pointed element. The rotating cochlea then severed his head, drawing in and mutilating both legs in turn. The lesions analysis and on-the-spot investigational probes provided fundamental data to reconstruct the dynamics of such a complex event.

This story of occupational accidents should highlight the importance of applying safety measures and correctly using workplace safety systems, such as suitable clothing or guards that prevent workers from careless maneuvers. The incident was later reported to the machine manufacturer: records showed that the combine harvester was periodically undergoing maintenance programs, but the worker had turned off the safety systems, probably due to overconfidence dictated by experience.

**References**

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