

# **An Accidental Death When Working with a Screw Log Splitter. A Case Report**

**Lorenzo Desinan**

Department of Experimental and Clinical Medicine, Legal Medicine Unit  
University of Udine, Italy

**Ugo Da Broi**

Department of Medical and Biological Sciences, Section of Forensic Medicine  
University of Udine, Italy

**Antonia Fanzutto**

Department of Medical and Biological Sciences, Section of Forensic Medicine  
University of Udine, Italy

**Valentina Zamai**

Department of Experimental and Clinical Medicine, Legal Medicine Unit  
University of Udine, Italy

**Gianfranco Pergher**

Department of Agriculture and Environmental Sciences (DISA)  
University of Udine, Via delle Scienze 208, Udine, Italy

**Sirio Rossano Secondo Cividino**

Department of Agriculture and Environmental Sciences (DISA)  
University of Udine, Via delle Scienze 208, Udine, Italy

**Rino Gubiani**

Department of Agriculture and Environmental Sciences (DISA)  
University of Udine, Via delle Scienze 208, Udine, Italy

Copyright © 2015 Lorenzo Desinan et al. This article is distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### Abstract

A case of the accidental death of a 42-year-old male injured by a screw log splitter in the yard of a private house necessitated a post-mortem examination and the technical evaluation of the machinery. The autopsy revealed fatal traumatic lesions to the head, caused by impact with a downward-moving log. Analysis of the scene of the accident showed that the machinery was not equipped with safety systems and was used incorrectly by the operators. The decision of the Criminal Court determined the absence of liability of the parties to be persecuted.

**Keywords:** Agricultural accident, Screw log splitter, Accidental death, Medico-legal autopsy, Evidence, Liability

## 1 Introduction

Medico legal experts and engineers may be required to act as expert witnesses in a Court of law and to give factual evidence and reconstruct the dynamics of events in order to help judges and juries make accurate decisions [1].

Before testifying, an expert witness must ensure that all the available and relevant data together form a logical and intelligible reconstruction of the events [2].

Under normal circumstances, the technical analysis of machinery leads to clear-cut conclusions, just as in medico-legal studies where the lesions observed at autopsy, supported by an understanding of the deceased's medical history and the other circumstances surrounding the death, must clearly be of a fatal nature if they are to be considered as the cause of death [3].

In the case presented here, the results of both the technical analysis and medico-legal investigations were straightforward, and the judge's conclusions were somehow unexpected.

## Case report

### 1. The event:

The owner (person A) of a screw log splitter, who had previously used the equipment many times without incident, had lent his machine to his next-door neighbor (person B), a healthy, 42-year-old, male bank clerk, and given him some basic instructions on how to use the splitter to cut timber in a yard next to his house. Person B had asked a friend of his (person C) for help. Neither friend (person C) was an expert and both were using the log splitter for the first time. Person C loaded the first beech log (*fagus sylvatica*) into the machine and the person

B was immediately struck on the head by the rotating log, and died shortly afterwards.

The friend also slightly hurt his left knee and right hand, though neither injury required medical treatment.

**2. Report on the event:**

The screw log splitter is normally powered by a tractor and is connected by a drive shaft to a screw cone: it is a piece of equipment which carried with it a high risk of accident [4-9].

Logs should be placed manually onto a working platform and should never be supported manually during the splitting procedure and, for security reasons, nobody else should be near the machinery when it is being used. Log splitters should also be equipped with an emergency stop in order to prevent rotation and lifting of the equipment during operation [4-9]. The equipment used in this case lack any of these safety features and safe-working procedures were not observed by the two men. Furthermore, the screw cone was rusty and the equipment appeared not be well maintained.

Person C took the first log (95 cm long, with a diameter of 25cm) and held it vertically between his knees in order to push the log against the screw, while person B was standing just to his right. Person C was unable to counteract the clockwise rotation of the screw driving into the log (for the presence of a knot in the wood) and lost control of the splitter, with the result that person B was struck hard on the head by the rotating log. Impact pressure on the cranium at the point of impact was estimated to be 500 kg. The victim had no time to react (he was hit in 8-10 hundredths of a second when normal reaction time is about 20 hundredths).

**3. Technical and functional specifications of the log splitter and a dynamic reconstruction of the event:**

The incident occurred in the private yard of a house, used for sawing and chopping timber. The machinery in question consisted of a 90 horse power farm tractor driving a conical screw log splitter. (Figure 1)

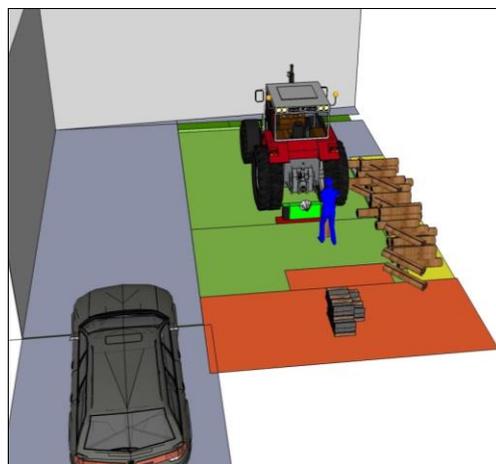


Figure 1 – Reconstruction of the scene of the accident

On examination, it was discovered that the log splitter was a home-made arrangement and was not equipped with any protective or safety devices (Figure 2).

The most dangerous part of the system and the source of greatest risk was the rotating screw which, when driven by a tractor engine, was capable of producing mechanical forces close to 50,000 Newton.



Figure 2 – a) example of a cone screw log splitter compliant with safety standards (the red circle shows the anti-rotation system);  
b) the machinery at the scene of the accident, overturned, without any safety features.

Expert witnesses reconstructed the crucial phases of the incident, which are illustrated in (Figure 3): Person C is shown in red loading the log and Person B in blue is the deceased.

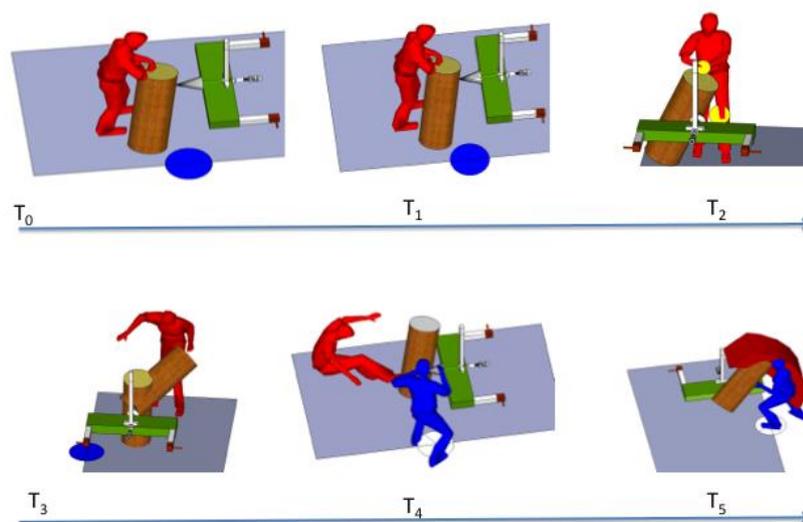


Figure 3 – The illustrations T0 to T5 show the sequence of events leading to the fatality

The following steps were identified by the expert witnesses:

T<sub>0</sub> person C prepares the log

T<sub>1</sub> person C pushes the log towards the spinning screw

T<sub>2</sub> the screw penetrates the wood, the equipment starts to twist and strikes person B (the points of contact are shown in yellow)

T<sub>3</sub> the log starts rotating

T<sub>4</sub> the position of person B when the log starts to rotate

T<sub>5</sub> person B is struck a downwards blow on the head

#### **4. Autopsy findings:**

External examination of the body identified serious head injuries. On the upper frontal-parietal area of the head there was a bloody T-shaped scalp laceration through the full thickness of the skin, with irregular edges, maceration and skin flaps. The main transverse split across the scalp measured 17 cm, and the shorter split pointing down towards the victim's forehead was 4.5 cm long; the anterior edge of the skin was separated from the bones of the skull for a length of 4 cm; fractured bone and brain tissue were visible through the laceration; bilateral black eyes and a bruise on the upper lip were also observed. Abnormal mobility was perceived on palpating the facial skeleton (periorbital regions, nose, right cheek-bone). Internal examination showed multiple complex skull fractures of the calvaria (in the frontal and parietal bones) and crushing of the facial skeleton, with intracranial haemorrhaging and severe cerebral contusions, indicating that the force was directed downwards.

There were no traumatic or pathological lesions on other parts of the body.

## **Discussion**

Fatalities occur frequently during the use of agricultural machinery on farms worldwide, as reported by Casey et al. and Lower et al. (21% and 26% of total agricultural accidents/fatalities respectively). Designers and manufacturers of all agricultural equipment and machinery should therefore pay special attention to accident prevention [9-10].

The autopsy findings and the dynamic reconstruction clearly indicated that this was an unusual agricultural accident which occurred due to a lack of any safety precautions and because the operators had no knowledge of the risks involved: Person B died from traumatic head injuries after being struck by a downwards blow from a rotating log.

The conclusions of the technical analysis of the equipment and set-up were clear and unambiguous: the screw log splitter was not equipped with any safety features.

The accident happened because the operating persons (Person B and person C), were not completely aware of the serious risks inherent the use of the machinery and did not pay sufficient care and attention, but the judge concluded

that no liability could be imputed to any of the parties involved. The owner (person A) of the machinery had no duty to equip the machinery with adequate safety systems before lending it, while the lending was an accepted social behavior not to be legally refused.

The friend (person C), who caused the death of person B when he used the log splitter in an inappropriate manner, had been asked to help without himself taking any initiative. He was working temporarily as a favour to person B. Furthermore, at the moment of the accident he was in the process of splitting the first log without having had any previous experience whatsoever. He was unable to evaluate or avoid the specific risks inherent in using the machinery, nor could he foresee that the screw cone might become embedded inside the log and cause it to start rotating.

In conclusion, this case highlights the urgent need for steps to be taken in the design and manufacture of machinery and in the improvement of safety training and awareness-raising among those using such equipment so as to prevent such tragedies in agricultural contexts [9-11].

## References

- [1] KD. Watson, *Forensic Medicine in Western Society, A History*, Routledge, London, 2010. <http://dx.doi.org/10.4324/9780203840290>
- [2] J. Payne-James, R. Jones, S.B. Karch, J. Manlove, *Simpson's Forensic Medicine, 13th Edition*, Hodder Arnold, London, 2011. <http://dx.doi.org/10.1201/b13324>
- [3] I. Frenckelton, D. Mendelson, *Causation in Law and Medicine*, Ashgate, Aldershot, England, 2004.
- [4] G. Pergher, R. Gubiani, S.R.S. Cividino, D. Dell'Antonia, C. Lagazio, Assessment of spray deposition and recycling rate in the vineyard from a new type of air-assisted tunnel sprayer, *Crop Protection*, **45** (2013), 6-14. <http://dx.doi.org/10.1016/j.cropro.2012.11.021>
- [5] B. Gaspardo, S. Del Zotto, E. A. Torelli, S.R.S. Cividino, G. Firrao, G.D. Della Riccia, B.A. Stefanon. A rapid method for detection of fumonisins B1 and B2 in corn meal using Fourier transform near infrared (FT-NIR) spectroscopy implemented with integrating sphere, *Food Chemistry*, **135** (2012), no. 3, 1608-1612. <http://dx.doi.org/10.1016/j.foodchem.2012.06.078>
- [6] D. Dell'Antonia, G. Pergher, S.R.S. Cividino, R. Gubiani, M. Cecchini, A.B. Marucci, Characterization of biomass emissions and potential reduction in

- small-scale pellet boiler, *Computational Science and Its Applications – ICCSA 2013, 13th International Conference, Ho Chi Minh City, Vietnam, June 24/27, 2013, Proceedings, Part II*, of the series *Lecture Notes in Computer Science*, **7972** (2013), 192 - 206.  
[http://dx.doi.org/10.1007/978-3-642-39643-4\\_15](http://dx.doi.org/10.1007/978-3-642-39643-4_15)
- [7] S.R.S. Cividino, O. Malev, M. Lacovig, G. Pergher, D. Dell'Antonia, R. Gubiani, M. Vello, BiogasAgriAtex, new methods of risk assessment explosion on biogas plants, *Applied Mathematical Sciences*, **8** (2014), no. 132, 6599-6619.  
<http://dx.doi.org/10.12988/ams.2014.46449>
- [8] G. Pergher, R. Gubiani, S.R.S. Cividino, D. Dell'Antonia, C. Lagazio, Assessment of spray deposition and recycling rate in the vineyard from a new type of air-assisted tunnel sprayer, *Crop Protection*, **45** (2013), 6-14.  
<http://dx.doi.org/10.1016/j.cropro.2012.11.021>
- [9] M.C. Casey, I. Robertson, B. Lang, F. Bennani, W. Khan, K. Barry, Farm-related trauma in the west of Ireland: an occupational hazard, *Irish Journal of Medical Science (1971-)*, **183** (2014), 1-4.  
<http://dx.doi.org/10.1007/s11845-013-1058-z>
- [10] T. Lower, E. Herde. Non-intentional farm injury fatalities in Australia, 2003-2006, *New South Wales Public Health Bulletin*, **23** (2012), no. 1-2, 21-26. <http://dx.doi.org/10.1071/nb11002>
- [11] C. Moreschi, U. Da Broi, S. Cividino, R. Gubiani, G. Pergher, Neck injury patterns resulting from the use of petrol and electric chainsaws in suicides. Report on two cases, *Journal of Forensic and Legal Medicine*, **25** (2014), 14-20. <http://dx.doi.org/10.1016/j.jflm.2014.04.004>

**Received: March 30, 2015; Published: September 30, 2015**