CASE REPORT

J. C. Rompen,[1] *M.S.; M. F. Meek,*[2] *M.D.; and M. V. van Andel,*[3] *M.S.*

A *Cause Célèbre*: The So-Called "Ballpoint Murder"

REFERENCE: Rompen JC, Meek MF, van Andel MV. A *cause célèbre:* the so-called "ballpoint murder." J Forensic Sci 2000;45 (5):1144–1147.

ABSTRACT: Transorbital intracranial injuries are uncommon but classic ophthalmologic traumas. This report describes a case of a woman who was found dead. Postmortem examination revealed a Bic® ballpoint which had penetrated her head through her right eye. Detective forces believed a murder to be the most likely cause; however, medical expert consultants indicated that a tragic accident was more likely. The case and the results of crossbow test-firing on human cadavers are presented.

KEYWORDS: forensic science, intracranial injuries, transorbital, ballpoint, crossbow

A 21-year-old student, X, went to his 53-year-old mother's apartment every Sunday evening to have dinner. It was on a Sunday in May 1991 when he discovered the dead body of his mother lying on the carpet in the living room. There were some small blood spatters on her clothes and there was a bloodstain on the carpet where her face lay. Her right upper eyelid was swollen.

Postmortem forensic autopsy revealed an intact black Bic® ballpoint within the cranium of the woman. It appeared that the ballpoint had perforated the right upper eyelid, the eye, the roof of the orbit and had penetrated deep into the brain. The point of the ballpoint was located in the left posterior lobe. The swollen eyelid made the back of the Bic invisible from the outside.

From the beginning of the investigation, detectives dealt with the case as a murder. The first consulted expert, a specialist for clinical forensic medicine, considered an extremely unfortunate accident to be more likely. The expert alleged that the woman stumbled with the ballpoint in her hand and fell onto the point of the pen. Another expert, an ophthalmologist, stated that a fall injury similar to that proposed by the medical forensic specialist is relatively rare but, nevertheless, a classic accident seen by ophthalmologists. Bursick and Selker found 21 intracranial pencil injuries since 1848 (1), eleven of which went through the superior orbital plate. Five people died due to the injury.

In spite of the statements of the two experts, the police labeled the case as murder. Extensive hearings with the victim's family did not yield any results and eventually the investigation was suspended for lack of evidence.

Approximately four years later the case was reopened. A hall porter of X's former secondary school who read about the "ballpoint murder" in the paper had declared to the police that he remembered a few pupils (including possibly X) talking about the "perfect" murder with a ballpoint pen, fired from a pistol crossbow. Another informant declared that X had made a confession to the murder of his mother. Initially this informant remained anonymous but later it proved to be X's psychologist. She declared X had told her, during one of their "Rational Emotive Therapy" sessions, that he himself had killed his mother with a pistol crossbow. X was arrested and in October 1995 he was sentenced to twelve years' imprisonment.

Intracranial Transorbital Penetrating Injuries

A literature study on intracranial stab injuries was carried out. Special attention was given to intracranial transorbital stab wounds by pencils. Simple orbital stab wounds are much more common. We found more than 40 intracranial transorbital stab wounds since 1848. Several objects caused the wounds: a radio antenna, a pencil, a ballpoint, a knife, a point of an umbrella, a crossbow arrow, pitchforks, a splinter, an iron spike, and a snooker cue (2,3).

Intracranial transorbital penetrating injuries are uncommon. Most frequently they are accidental and sometimes suicidal (1,3,4). The majority of accidental injuries occur in the first decade of life and more often in boys than in girls (5).

An object that penetrates through the orbit into the brain may leave only a small entrance wound. This is why, initially, intracranial penetration is often unsuspected (2,6). The onset of neurological symptoms is often delayed by days to weeks, or sometimes even years, but morbidity is high. Fifty percent of the survivors display permanent impairment, including visual loss, optic atrophy, hemiparesis, sensory loss, ophthalmoplegia, hydrocephalus, seizures, and/or behavioral disturbances (1). The victim in this reported case had died immediately due to laceration of the brainstem and postmortem autopsy revealed blood in the ventricular system. It was quite extraordinary that the eyeball of the victim in the case reported had been perforated, whereas in most cases described in the recent literature, perforation did not occur (7). The eyeball is usually pushed aside and only the soft tissues between the eyeball

[1] Medical research student, Medical Faculty, University of Groningen, Groningen, The Netherlands.

[2] Department of Plastic and Reconstructive Surgery, University Hospital Groningen, Hanzeplein 1, 9700 RB Groningen, The Netherlands.

[3] Laboratory for Histology and Cell Biology, University of Groningen, Oostersingel 69-II, 9713 EZ Groningen, The Netherlands.

Received 15 March 1999; and in revised form 17 Sept., 22 Nov. 1999; accepted 22 Nov. 1999.

and the orbital wall are injured (8). The left eye is involved more frequently than the right eye, possibly because the assailant is more frequently right-handed (5).

Crossbow injuries have become more and more unusual since the invention of firearms. Still, a crossbow is easy to obtain, relatively quiet and potentially lethal (9). Crossbow injuries are most often suicidal or accidental. Only a few crossbow homicides have been reported (9,10). Arrows with sharp tips were used in all reported cases. We found no case report of attempted murder by intracranial penetration through the orbit by crossbow shots.

Test-firing Bic® Ballpoints with Crossbows

We wondered if it was possible to fire a Bic® ballpoint from a pistol crossbow into a human head, creating an injury as described in the case report above. Due to ethical objections human material could not be obtained; therefore, we used fresh pig cadavers. The Barnett Phantom pistol crossbow with 24 lb (10.9 kg) tractive power could initially not give the ballpoint enough energy to penetrate the eyelid or the roof of the pig orbita. Only the uncovered eyeball could be penetrated. All shots were "contact" shots, i.e., the crossbow being held as closely as possible to the eye. In this way the power will be maximum. The pig model proved to be completely inadequate. The irrelevance of the results with pig material kept us from presenting them in this report.

At the request of the suspect's lawyers, an ophthalmologist and orbital specialist V.D.POL experimentally fired ballpoints with a crossbow at human cadavers. In December 1995 we carried out a similar experiment on human material, without knowing the results of the experiments carried out by V.D.P.

Materials and Methods

Two independent research groups used the same experimental setup. Both groups (i.e., V.D.POL and the present authors) used the same Bic ballpoints (the well-known hexagonal type, weight 4.75 g, length 14.5 cm and without cap at the back of the pen) as was found in the victim, as well as a Barnett Phantom pistol crossbow.

TABLE 1—*V. Andel results. All shots were in the same eye. The shoot direction of the three shots was progressively more vertical. For further discussion see text and figures.*

Shot	1	2	3
Tractive power crossbow	44 lb	44 lb	44 lb
Protruding part ballpoint after shot (mm)	45	15	97
Roof orbita perforated	no	no	yes
Shaft ballpoint damaged	?	yes	yes
Telescoping	yes	yes	yes

However, V.D.POL used a crossbow with a draw of 22 lb (10 kg). Two human cadavers with closed eyes were used. We used a crossbow with a draw of 45 lb (20 kg). The left half of a head of a subject for dissection was used. The calvaria, brains, and meninges were then removed.

In addition, V.D.POL also used a Defender crossbow requiring a draw of 90 lb (40 kg), because it was noted that the draw of 24 lb was too low. In both series, all shots were "contact" shots and the pistol crossbow was held by hand. The shots were directed at the roof of the orbita in order to create a situation which could be compared to the situation found in the reported case. The head was firmly fixed between two planks laterally.

Results

The ballpoint fired by the first shot of V.D.POL with the light crossbow (draw of 24 lb) showed no damage of the shaft of the ballpoint. All other experiments of V.D.POL and ours yielded independently the same results: all ballpoints fired from the three used crossbows were damaged. After the first shot of V.D.POL, an impression of the crossbow string in the back of the ballpoint was noticed. The same phenomenon was found in all other experiments by V.D.POL and ourselves.

After firing a ballpoint from a crossbow, the shaft of the ballpoint often showed bursts (66%). All ballpoints fired with crossbow 2 (80 lb) by V.D.POL showed characteristic ink stains on the inside of the shaft. During the strong acceleration of the ballpoint, the ink tube slides off the conus, leaving a small space. During the collision the ink tube is probably partly pushed back up the conus and a small stain of ink that had escaped from the tube now splashes into the shaft. This mechanism could explain how the ink stains arose in the shaft. Figure 1 shows an escaped ink stain at the junction of the ink tube and conus after our third shot.

Every time a ballpoint perforated the orbita, the interior extensible part of the ballpoint (ink tube) was pushed out of the shaft and had protruded further in the skull than the shaft. Apparently the shaft slows down faster than the interior part of the ballpoint and due to inertia the interior part continues its motion and shoots through. We called this effect "telescoping" of the interior part. Telescoping of the ink tube was a serendipitous finding and seems almost inevitable due to the construction of the ballpoint; the thick shaft of the Bic slows down faster than its contents. This phenomenon is well known in archery; when an arrow perforates a target, the metal point often comes lose from the arrow shaft.

The three shots in our series were fired under progressively steeper angles with the orbital roof. When the ballpoint hits the roof of the orbita under a small angle, it slides down to the deepest part of the orbital funnel. This happened in the first shot; the ballpoint went through the optic canal. Telescoping of the ink tube, also described by V.D.POL, was obvious (Fig. 2). Shot 2

TABLE 2—*V.D.POL. results. For discussion see text and figures.*

Shot	1	2	3	4	5	6
Tractive power crossbow	24 lb	80 lb	80 lb	80 lb	80 lb	80 lb
First/second shot in same eye	first	first	first	first	second, same eye as shot 3	second, same eye as shot 1
Protruding part ballpoint after shot (mm)	93	78	83	90	90	60
Roof orbita perforated	no	yes	no	yes	yes	yes
Intracranial penetration (mm)	no	10	no	10	5	30
Impression of crossbow string in ballpoint	yes	yes	yes	yes	yes	yes
Shaft ballpoint damaged	no	?	yes	yes	yes	yes
Telescoping	no	yes	yes	yes	yes	yes

FIG. 1—*After third shot. Orbital roof perforated but only little protrusion of the shaft. The conus is drawn out of the ink tube, an ink stain is visible at the junction conus-ink tube. The shaft is burst. (V. A.)*

went through the same trajectory but the shaft of the ballpoint protruded deeper because the bony resistance had decreased after the first shot (Fig. 3). The third shot perforated the orbital roof but intracranial penetration was minimal (Fig. 1). Figure 1 shows that the conus was drawn out of the ink tube, probably due to inertia of the ink tube during firing. This finding was also described by V.D.POL as mentioned before.

No ballpoint, fired from the crossbows used, penetrated the head as far as the ballpoint in the head of the victim in the presented case.

Discussion

The present study shows how a Bic ballpoint, fired from a pistol crossbow, penetrates a human head through the orbital structures. Due to lack of human material it was not possible to set up a scientifically and statistically valid experiment. In spite of the small number of experiments, the following observations were made:

1. The crossbows used could not fire the ballpoints with enough energy to penetrate as far as the ballpoint in the head of the victim in the case reported. A bigger crossbow was needed.
2. After every penetrating shot, we saw telescoping of the interior part. Telescoping was not seen at all in the ballpoint in the head of the victim in the case reported. The described experiments do not indicate if the presence of brains and meninges can partially prevent telescoping (but telescoping has been made highly probable from model experiments not discussed here).
3. To shoot the ballpoint in the same position as the ballpoint in the head of the victim in this case, one needs, as stated above, a larger crossbow with more tractive power. Such a crossbow would damage the ballpoint even more. The ballpoint in the head of the victim was undamaged.

Furthermore, there were no personal reasons to assume that X had murdered his mother. X had a good relationship with his mother. The hall porter of X's former secondary school made his

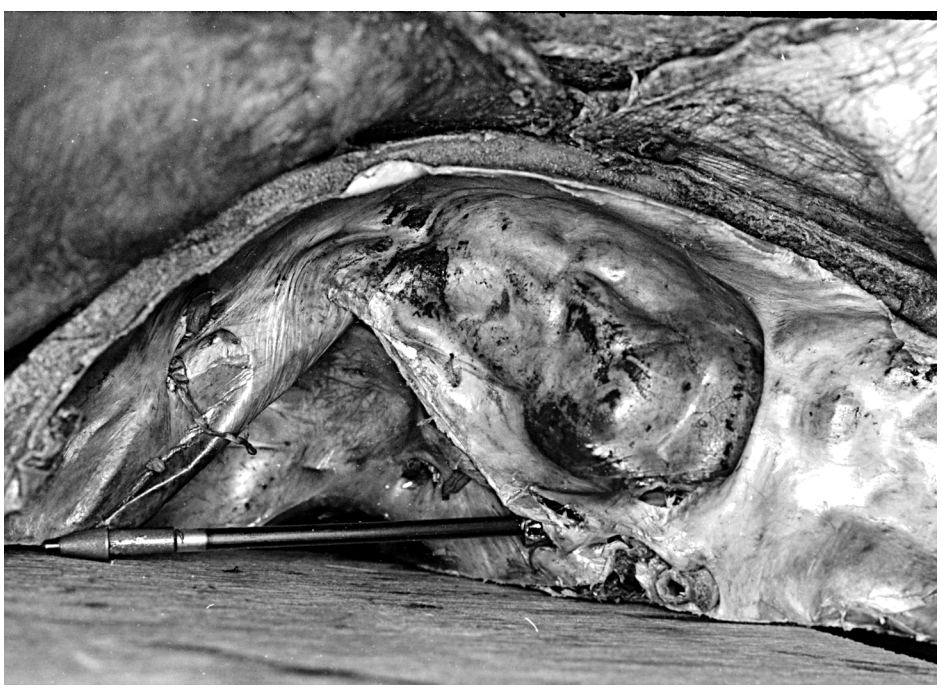

FIG. 2—*Telescoping of the ink tube. The ballpoint went through the optic canal. (V. A.)*

FIG. 3—*Intracranial penetration after second shot. Again telescoping of the ink tube—this time the shaft also penetrated into the skull because of the decreased bony resistance after the first shot. (V. A.)*

declaration seven or eight years after he thought he had spotted the pupils in question. The therapist, who declared that X had made a confession to her, violated her professional oath, which is an offense. It is incomprehensible that in the first instance the court used the testimony of X's therapist as legal evidence. Psychologists and psychiatrists usually focus on the patient's subjective reality whereas they are minimally trained to determine objective reality. In the role of experts, psychologists and psychiatrists often fail to achieve reliable and valid conclusions, raising doubt that they meet the legal standards required for expertise (11).

X, sentenced to 12 years' imprisonment in October 1995 was provisionally set free in January 1996, in part due to the results of the described crossbow tests and in part because the incriminating evidence was considered unconvincing. In April 1996, X was finally acquitted on appeal.

Although the experiments described led to public discussion on the ethical aspects of the use of human cadavers for this purpose, important evidence was obtained that proved that a ballpoint could not have been used as a projectile fired from a pistol crossbow without detectable damages to the ballpoint.

Acknowledgment

We gratefully acknowledge Prof. P. H. Robinson for carefully reading the manuscript.

References

1. Bursic DM, Selker RG. Intracranial pencil injuries. Surg Neurol 1981;16(6):427–31.
2. Bard LA, Jarrett WH. Intracranial complications of penetrating orbital injuries. Arch Ophthalmol 1964;332–43.
3. Kirkby GR. Penetrating orbitocranial injury with a snooker cue. Br Med J Clin Res Ed 1986;293(6562):1646.
4. Bowen DI. Self-inflicted orbitocranial injury with a plastic ballpoint pen. Br J Ophthalmol 1971;55(6):427–30.
5. Villiers JC de, Sevel D. Intracranial complications of transorbital stab wounds. Br J Ophthalmol 1975;59:52–6.
6. Wesley RE, Anderson SR, Weiss MR, Smith HP. Management of orbital-cranial trauma. Adv Ophthalmic Plast Reconstr Surg 1987;7:3–26.
7. Albert DM, Burns WP, Scheie HG. Severe orbitocranial foreign-body injury. Am J Ophthalmol 1965;60(6):1109–11.
8. Duke-Elder S. Perforating wounds of the eye. In: Duke-Elder S, editor. System of Ophthalmology. London: Kimpton 1972; Ch 3.
9. Rogers C, Dowell S, Choi JH, Sathyavagiswaran L. Crossbow injuries. J Forensic Sci 1990;886–90.
10. Hain JR. Fatal arrow wounds. J Forensic Sci 1989;691–3.
11. Faust D, Ziskin J. The expert witness in psychology and psychiatry. Science 1988;241:31–5.

Additional information and reprint requests:
M. V. van Andel
Oostersingel 69 II
9713 EZ Groningen, The Netherlands
m.v.van.andel@med.rug.nl