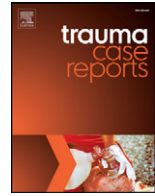




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## Trauma Case Reports

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### Case Report

# Severe ocular trauma—The hidden danger of plastic bottles when throwing out the rubbish

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### ABSTRACT

This is the first reported case of ocular trauma caused by a plastic bottle cap occurring accidentally without misuse. The mechanism involved an un-emptied plastic bottle containing orange juice being thrown away with other rubbish. The combination of this minor impact and the pressure built up within the bottle through fermentation caused expulsion of the cap at high velocity. This cap caused severe ocular trauma requiring urgent ophthalmic assessment and intervention. Our simple recommendation is that plastic bottles have their caps removed and are emptied before being thrown away.

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### Case history

After cleaning up at the end of term, a 20-year-old medical student threw away his rubbish bag into a communal bin. He was unaware that this bag contained a 1 l polyethylene terephthalate (PET) bottle half-filled with 3 month old fermenting orange juice (Fig. 1). As the bin bag landed, this pressurised plastic bottle exploded expelling the cap at high velocity. After perforating the bag, the cap struck the student's left orbital rim and eye (Fig. 2) before ricocheting away about 10 m.

On presentation at an ophthalmic accident and emergency unit, his left visual acuity was reduced to 6/60. The left eye suffered significant injury with a circulating hyphaema and reduced intraocular pressure (IOP) of

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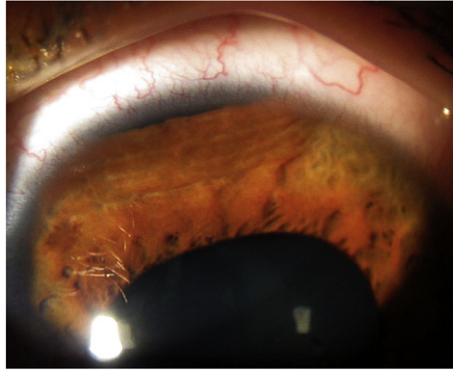


**Fig. 1.** PET bottle.

8 mmHg. Further assessment of his eye was only possible after the hyphaema had cleared over the following 7 days. The examination revealed extensive superior iridodialysis (disinsertion of the iris) (Fig. 3) with vitreous prolapse into the anterior chamber and 360° of angle recession. The left anterior chamber (AC) was hyper-deepened (AC depth of 4.1 mm in the left versus 3.3 mm in the right eye) with a consequent hyperopic shift of 2 dioptres. Over the first 7 days his left IOP increased to 30 mmHg and required treatment with topical medical therapy. Posterior segment examination showed central commotio retinae.



**Fig. 2.** Eye after 24 h.



**Fig. 3.** Iris close up at 22 days.

## Discussion

Ocular trauma causes considerable visual morbidity globally, with estimates suggesting 750 000 cases requiring hospitalisation each year, 200 000 of which are open-globe injuries [1,2]. There are 3.9 million people with bilateral low vision or blindness from ocular trauma and more than 18 million with unilateral visual impairment [1]. Pressurised glass bottle cap and splinter injuries have been estimated to account for 0.7–2.4% of severe ocular trauma [3,4]. This mechanism of injury has been well described within the literature and as result there has been a well-reasoned shift from using glass to plastic bottles.

This patient suffered a severe sight-threatening injury to his left eye due to an exploding PET bottle. PET is the most common thermoplastic polymer resin used to make plastic containers for perishable goods. Due to the robust nature of PET, plastic bottles can reach very high pressures before exploding [5]. This means previously opened and recapped PET bottles containing fermenting liquid can become highly pressurised over time. Minor impacts to such bottles can cause sudden expulsion of the cap as a high velocity projectile. In this case the bottle and cap (Fig. 1) had no evidence of internal or external damage, suggesting that not screwing the cap on properly was an important factor in the mechanism of injury.

Only one similar PET bottle injury has been reported so far, but this occurred as a result of deliberately crushing a plastic water bottle [6]. We believe this to be the first reported case of ‘passive’ accidental plastic bottle injury without misuse.

## Recommendations

Although plastic bottles are undoubtedly safer than glass bottles, this does not make them harmless. This case demonstrates their hidden danger in what is a normal everyday household activity. We would recommend all plastic bottles have their caps removed and are emptied before being thrown away.

## Conflict of interest

The authors declare that they have no conflict of interest.

## References

- [1] A.D. Négrel, B. Thylefors, The global impact of eye injuries, *Ophthalmic Epidemiol.* 5 (3) (1998) 143–169.
- [2] J. Abbott, P. Shah, The epidemiology and etiology of pediatric ocular trauma, *Surv. Ophthalmol.* 58 (5) (2013) 476–485.
- [3] F. Kuhn, V. Mester, R. Morris, J. Dalma, Serious eye injuries caused by bottles containing carbonated drinks, *Br. J. Ophthalmol.* 88 (1) (2004) 69–71.
- [4] W.F. Schrader, E. Gramer, Open globe injuries induced by glass bottles containing carbonated drinks, *Graefes Arch. Clin. Exp. Ophthalmol.* 248 (3) (2010) 313–317.
- [5] MatWeb. Material Property Data. <http://www.matweb.com/index.aspx>. (Accessed August 15, 2015)
- [6] S. Roh, M.E. Patron, Images in clinical medicine. Ocular trauma due to a water-bottle cap, *N. Engl. J. Med.* 358 (21) (2008) 2265.