

## CASE REPORT

### Airbag-induced open forearm fracture with bone loss in a 12-year-old child

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#### KEYWORDS

Bone defect;  
Airbag;  
Open fracture;  
Forearm;  
Adolescent

#### Abstract

*Purpose:* To report on an unusual type of injury for a pediatric patient and describe its probable mechanism.

*Clinical case:* A 12-year old male traveling in the right front seat of a 4-wheel drive vehicle that was involved in a road accident and sustained an open grade IIb right ulna and radius fracture with bone loss in the latter.

*Discussion:* We do not know of any other case like this in the literature. The injury we present is not only unusual for a passenger in a vehicle, but is – in our view – also exceptional in pediatric patients.

*Conclusions:* Life-saving as it can be, airbag deployment is a violent occurrence that can threaten a child's life. The possibility of sustaining airbag-induced injuries must not be underestimated. Such injuries should be prevented by taking appropriate prevention measures and by conducting further research into the subject.

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#### PALABRAS CLAVE

Defecto óseo;  
Airbag;  
Fractura abierta;  
Antebrazo. Adolescente

#### Fractura abierta del antebrazo con pérdida de sustancia ósea por *airbag* en un niño de 12 años

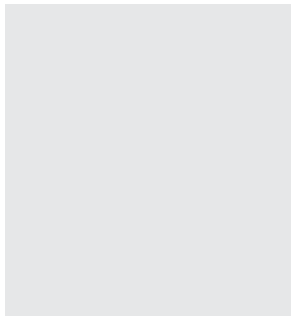
#### Resumen

*Objetivo:* Se presenta una lesión poco frecuente en un pasajero de edad pediátrica y su mecanismo de acción.

*Caso clínico:* Varón de 12 años que viajaba en el asiento delantero derecho en un vehículo todoterreno que se vio involucrado en un accidente de circulación, y por el que sufrió

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una fractura abierta grado IIIB del cúbito y el radio derechos con pérdida de sustancia ósea de éste último.

*Discusión:* No se conoce otro caso similar que se haya publicado en la bibliografía médica. La lesión que se presenta es infrecuente en un pasajero de un vehículo y excepcional en pacientes de edad pediátrica.

*Conclusiones:* El despliegue del *airbag* puede salvar una vida, pero es un acontecimiento violento que pone en riesgo la vida de los niños. La posibilidad de tener lesiones por *airbag* no se debe infravalorar; deben adoptarse las medidas oportunas, además de investigar más profundamente el tema para evitar estas lesiones.

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## Introduction

The 1980's saw the introduction of airbag systems in serial produced motor vehicles, which led to a sharp decrease in motor vehicle accident mortality. A few years later, when airbag systems started being installed on the passenger's side, the United States' Highway Traffic Safety Administration issued a warning about the dangers that such systems can pose to children travelling in the right front seat<sup>1</sup>. In spite of this, many children under the age of 14 can still be seen in that seat.

Numerous cases have been published of upper limb fractures caused by airbag deployment. However, far fewer reports exist on such injuries in passengers occupying the right front seat. The only case that has been reported in that of a 60-year-old woman who sustained a distal radius fracture<sup>2</sup>.

## Clinical case

We present the case of a 12-year-old boy who was travelling in the right front seat of a vehicle that was involved in a

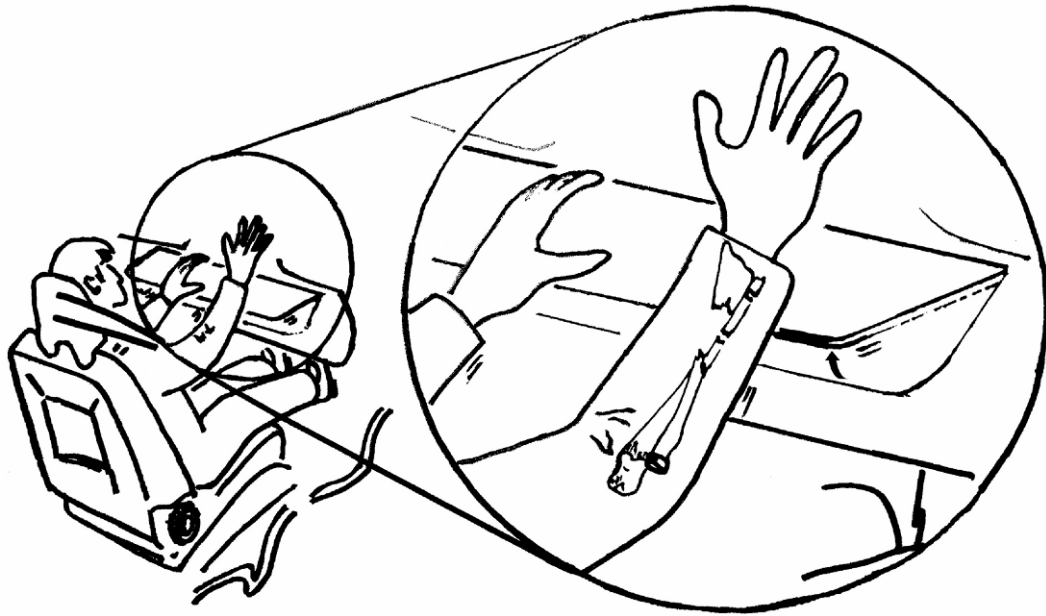
road accident. On arrival at the hospital, he presented with a 5 cm long injury on the radio-volar aspect of the forearm, a stabbing wound on the ulnar border and a crushing injury on the volar aspect of the forearm. The neurovascular examination did not reveal any pathological findings. An urgent initial cleaning and coverage of the injuries was made and a forearm splint was applied. The x-ray study



**Figure 1** A) Anteroposterior and B) lateral pre-op x-rays.



**Figure 2** Radiographs showing complete incorporation of the autologous graft. A) Anteroposterior (AP) view. B) Lateral view.



**Figure 3** Suspected mechanism of injury related to airbag deployment.

revealed an ulnar and radial shaft fracture with loss of bone stock in the latter. This led to a diagnosis of an open grade IIIB radial and ulnar fracture with a 12 cm loss of bone stock (fig. 1). The patient was urgently transferred to the operating theatre. A surgical examination of the injuries was performed and a single muscular lesion was identified (in the flexor pollicis longus), which was sutured. The ulnar fracture was fixed with an intramedullary Kirschner wire and a Hoffmann II external fixator was applied (Stryker, Selzach, Switzerland) on the radius in order to preserve the bone's length and alignment. Subsequently, the paramedics supplied the surgical team with the missing radial fragment but a decision was made not to reimplant it because it was contaminated.

Two weeks later, after making sure of the total absence of infection, a vascular fibular graft was applied and fixed with reconstruction plates. A suprasyndesmotomic screw was placed in the donor site to prevent secondary deformities.

At the last follow-up visit, after about 20 months' evolution, the graft appeared to have healed completely (fig. 2), the patient had begun his rehabilitation and presented with limited balance of the joint in the last degrees of pronosupination. To date, no alteration has been found in the left lower limb.

## Discussion

Vehicle accident mortality has decreased drastically since the installation of airbag systems. However, there has been an increase in the number of injuries provoked by the airbag itself. These injuries tend to be caused by direct trauma from the airbag system or by a blow to the upper

extremity as it is knocked sideways during the airbag deployment phase<sup>3</sup>. If it is infants that are travelling in the right front seat, airbag deployment can even cause them to die. Injury and fracture patterns vary with patient age and weight<sup>4</sup>.

The majority of upper limb fractures are sustained by drivers. As regards passengers occupying the right front seat, we only had the case of a 60-year-old osteoporotic woman who sustained a Colles' fracture with loss of 12 cm of bone stock at the radial shaft resulting from airbag deployment<sup>2</sup>. We have not found any similar cases in pediatric patients in the medical literature.

The authors of this study surmise that the fracture occurred when the patient, seeing that the collision was imminent, extended both upper limbs in a defensive attitude, at which point the airbag deployed, with the cover of the airbag module hitting the volar aspect of the woman's forearm (fig. 3).

Furthermore, in line with Quiñones-Hinojosa et al<sup>4</sup> y Grisoni et al<sup>5</sup> they relieve that children under 14 years of age should travel in the back seat with their seat belts fastened; if for any reason they had to be seated in the right front seat, the latter should be drawn as far away as possible from the airbag module, since there seems to exist a relationship between the severity of the injury and proximity of the child to the airbag module.

To conclude, airbag deployment can save lives, although it is a violent occurrence that may jeopardize the life of children. The possibility of presenting with an airbag-induced injury must not be underestimated, with the necessary measures being adopted and in-depth research being conducted to avoid these injuries.

## Conflict of interests

The authors have declared that they have no conflict of interests.

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