

**CASE REPORT****PATHOLOGY/BIOLOGY**

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## Fatal Accidental Hanging by a High-chair Waist Strap in a 2-Year-old Girl

**ABSTRACT:** High chairs are commonly used to feed children after 6 months. Related injuries are oftentimes minor and rarely leading to death. We describe a case of a 2-year-old female child who used to jump alone on her high chair and also had the habit to fasten the straps by herself. Her mother found her hanging by the waist straps. A thorough investigation showed that she climbed her high chair and fastened the waist straps but not the crotch one. The girl slid down into the seat, trapping her neck in the waist straps and thus resulting in hanging. In here, we concluded that the victim's death was caused by asphyxia, itself, caused by accidental hanging. The present case is of a special interest because of the rare similar cases reported. This case suggests that a correct restraint use and a close supervision would have prevented such a fatal issue.

**KEYWORDS:** forensic science, forensic pathology, hanging, accidental, high chair, strap

The use of the high chair has become widespread in recent years. Manufactures exposed diverse varieties with many features: they can be folded, reclined, adjusted in height, and used in multiple ways with fashionable colors and different designs. High chairs are essentially made up of metal, plastic, or wood adjustable seats with varieties of security straps and fixed or removable trays. While sitting in the high chair, children are usually held by both waist and crotch straps. The latter are made up of synthetic tissue that is not detachable and so strong that it cannot be torn if they are stretched. Thus, in case of slipping and trapping the neck, the strap is strong enough to support the body weight, yet causing neck sup-pression and leading to subsequent death.

In this report, we will analyze a case of accidental asphyxial death caused by hanging because of high-chair waist straps and we will review the medical literature with a special focus on the role of pathologist in prevention against such type of accidents.

### Case Report

A 2-year-old girl was found unconscious by her elder sister in the early morning, completely suspended by the neck to her high-chair waist strap, in the kitchen in front of a TV set (Fig. 1). The sister called her mother, who lowered the victim from the high chair, laid her on the bed, and called the emergency service. Resuscitation was unsuccessful. Accordingly, the victim's body as well as the high chair was brought to the forensic institute for autopsy.

External examination showed a well-developed and well-nourished 2-year-old child. Multiple petechial hemorrhages were seen in the periorbital regions and in the conjunctival palpebral mucosa,

and dark postmortem hypostasis was noted on the back and the lower areas of the arm and leg of the victim.

A horizontal and superficial ligature mark, approximately 7 × 4 cm size, was observed, beginning in the anterior part of the right side of the neck and ending in the left side. In addition, two linear and parallel marks measuring 3 and 2 cm in length were discovered on the surface of the left side of the neck, about 1 and 4 cm below the jaw angle, respectively. A point-shaped abrasion was observed at the end of the first linear mark. These marks probably corresponded to the position of the buckle waist strap (Fig. 2).

This was associated with small intramuscular hemorrhages observed on the left anterior part of the sterno-cleido-mastoid muscle and the sternal insertion of the right sterno-thyroid muscle. No cervical nor any other string of injuries was observed. Toxicological analysis was negative and pathologic examination revealed diffuse hemorrhage of all organs because of asphyxia. Thus, interrogatory of the parents revealed that the girl commonly used to sit by herself on her high chair and buckle automatically the waist strap but not the crotch one (Fig. 3). They added that the deceased had no past medical history.

Thus, death was attributed to asphyxiation by hanging of the high-chair waist straps.

### Discussion

Children are at risk of injury and death from accidents for a variety of reasons. First, they have a natural curiosity that leads them to explore their environment and investigate situations where they often do not recognize potential hazards (1). Lack of physical strength, small size, inexperience, and immature coordination may also result in infants and children being unable to extricate themselves from potentially perilous positions that may not present a danger to an adult (2,3).

Injuries associated with high chairs can occur in case the chair falls down or when the child falls from the chair. Another reason

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FIG. 1—Reconstruction of the child's position when she was found dead. The child was slid down into the seat trapped the neck by the waist strap and hanged. Note that the body was retained on the neck by the waist strap. She leaned against the seat and her feet touched the floor by the tiptoe.



FIG. 2—The observed marks on the neck correspond to the position of the waist strap and buckle. A horizontal and superficial ligature mark approximately  $7 \times 4$  cm of size begins at the anterior part of the right side and end at the left side of the neck. Worth noting also, two linear and parallel marks measuring 3 and 2 cm in length on the surface of the left side of the neck could be seen. These two marks are situated at about 1 and 4 cm, respectively, under the left jaw angle. The former ends with a point-shaped abrasion.

is the fact that the chair is malfunctioning or if a child's body part is entrapped (4). Accidental asphyxia may occur in younger children and infants. In this field, Byard found the mean age of such infants to be 10 months, with an upper limit being 3 years (2). Our case is in accordance with this observation.

In the present case, several factors led to the asphyxia of the child. We speculated that because of lack of coordination and because the victim was not fastened properly but also because of insufficient physical strength to free herself from the waist straps,



FIG. 3—This was the high chair used by the girl. The leg strap was not buckled to the waist one. The two straps are made up of a very resistant, yet thin synthetic tissue of 3 cm of width. The waist strap is provided with a closing system in "loop clip" and is fixed to both, the left and right sides. The leg strap is fixed at the sat of the seat of the high chair and sticks to a "part guides" on the back of the waist strap closing system. Worth mentioning too, it is a classical high chair with a metal support structure and a seat platform with a removable plastic tray. We also found a certificate of safety at the back of the seat.

the child sled down into the seat, hung, and dropped dead. On the other side, the child had the habit to get on her high chair and to buckle the straps without any assistance of the mother. Thus, we think that placing a child on her high chair with no strict supervision cannot alert the mother and lead to a lethal outcome. As in the reported cases, death may not be directly because of manufacturing or misuse of security straps, but it can also occur when children are not correctly installed and closely supervised. Therefore, parents must teach their children never to get alone on their high chairs.

The case we are tackling is more often accidental rather than deliberate. As such, this might be attributed to several reasons. Children's accidental asphyxia may implicate the child's milieu that may include plastic pillow, mattress coverings, beanbags, defective or badly constructed cots, seat or bouncinette harnesses, bed bars, lanyard key, waterbeds, rocking cradles, or adult beds as contributing or causal factors in the fatal episode (5–10). However, the child's world may certainly contain the high chair. Thus, complete investigation of the scene of death and examination of the body in accidental cases is of a major importance (11). In the studied case, no injuries, except for a ligature mark and conjunctival petechiae, were found on the body. The police investigation revealed that no mistreatment or abuse in family caused the death. Besides, homicidal hanging by high-chair straps is not a common cause of infant homicide (11). Furthermore, the asphyxiation had occurred from pressure of the strap on the neck because of the child's body weight, and classic signs of asphyxia were found in her body. Therefore, we speculated that this case was not homicidal but purely accidental.

Nonfatal accidental trauma from high chairs is common. Powell et al. (4) found an estimated 40,650 high-chair-related injuries to such children. An estimated 5231 injuries (13%) were related to

the use of an attachable high chair (including booster seats) and an estimated 4067 (10%) were related to the use of a youth chair. In this study, most injuries are minor and involved the head (44%) or the face (39%). Only an estimated 8% resulted in fractures and 2% required admission to the hospital. In this study, accidental asphyxia (hanging) has never been reported (4).

In fact, it is very rare for children to be asphyxiated by the high-chair waist strap. Krauss reported that 19% of strangulation involving infants is associated with child product, such as pacifier cord, Venetian blinds, and high-chair straps (12). Furthermore, Drago and Dannenberg (6) found that death because of entrapment with suspension in high chair rarely occurred (1%). "L'Institut Nationale de Veille Sanitaire," reports about 133 accidents from high chairs in France between 1999 and 2001 involving children <5 years old and no fatal accidents were observed (13).

Perhaps, the most constructive step that a pathologist can take in these cases is not to dismiss them as merely another example of one of the inevitable risks of early life. The pathologist is in an excellent position to identify these hazards and can recommend that cots in which infants and toddlers have died may be formally assessed by product safety experts. This step alone may lead to the withdrawal of defective cots from sale and the introduction or modification of design standards. The collaboration between the pathologist hospital clinicians and health promotion departments may also provide another opportunity for highlighting the dangers of certain situations (2,14–16).

The CPSC safety requirements for high chair are as follow. High chairs should have a waist strap and a strap that runs between the legs. Children should always be restrained by both straps. The tray should not be used as a restraining device in place of the straps. And, it is necessary that the waist belt has a buckle that cannot be fastened unless the crotch strap is also used. Besides, children must always be installed and fastened by their parents. Finally and most importantly, children must always be closely and continuously supervised by their parents [<http://www.cpsc.gov/cpsc/pub/pubs/202.pdf> (accessed October 2008)].

In our case, beside the fact that the crotch strap was not buckled, lack of information to the parents about the necessity of serious overseeing of their children unless they are correctly installed and fastened, certainly contributed to the lethal outcome.

## Conclusion

While a high chair is clearly the best and safest place to feed a child, there have been hazards concerning their use.

Injuries related to high chairs are diverse, particularly among children in the first year of life. They often result from falls. However, fatal accidents from hanging are still rarely described. Most of these accidents are preventable.

The production of information pamphlets and packages for parents and the recall of certain dangerous products following recommendations made by pathologists demonstrate that pediatricists and forensic pathologists play a crucial role in preventive medicine issues and in formulating public health strategies.

This case might be used by legislators to upgrade child restraint laws to be in closer alignment with current best-practice recommendations.

An effective prevention plan must include education, product labeling, and modification. In a nutshell, pathologists as well as health care providers can play an important role in the dissemination of prevention information to caregivers and manufacturers to reduce the incidence of these injuries in young children as much as possible.

In our case, proper information of the parents concerning the use of the high chair would certainly have saved her life.

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