



SPECIAL ARTICLE

Recommendations for the prevention of foreign body aspiration[☆]



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Abstract The aspiration of a foreign body remains a common paediatric problem, with serious consequences that can produce both acute and chronic disease. Aspiration usually causes a medical emergency that requires a prompt diagnosis and an urgent therapeutic approach as it may result in the death of the child or severe brain injury.

It typically involves organic foreign bodies (mainly food or nuts) aspirated by children under 5 years old, and usually at home.

In this statement, the Committee on Safety and Prevention of Non-Intentional Injury in Childhood of the Spanish Paediatrics Association provides a series of recommendations, both educational (while eating and playing), as well as legal, to prevent such episodes.

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PALABRAS CLAVE

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Recomendaciones sobre la prevención de aspiraciones de cuerpos extraños

Resumen La aspiración de un cuerpo extraño sigue siendo un problema pediátrico frecuente, con graves consecuencias, pudiendo producir tanto patología aguda como crónica. Suele afectar a niños por debajo de los 5 años, normalmente en su domicilio, que aspiran por lo común alimentos o frutos secos. Esta circunstancia puede provocar una crisis de asfixia aguda, constituyendo una urgencia médica que requiere de un diagnóstico precoz y una actitud terapéutica urgente, ya que puede producir la muerte en unos minutos.

En el presente artículo, el Comité de Seguridad y Prevención de Lesiones No Intencionadas en la Infancia de la Asociación Española de Pediatría proporciona una serie de recomendaciones, tanto educativas (en la alimentación y en el juego) como legales para prevenir este tipo de lesiones.

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Introduction

Foreign body aspiration continues to be a common problem in paediatrics that may have severe consequences, as it can result in both acute and chronic health problems. Aspiration usually becomes a medical emergency that requires a prompt diagnosis and an urgent approach to its management. Unfortunately, it may not only result in immediate death, but in some cases it can also cause severe brain injury due to hypoxia.¹

In other cases, foreign body aspiration may cause chronic respiratory disease, producing atelectasis, pneumonia, bronchiectasis, etc.^{2,3}

Consequently, it is important to promote a series of prevention and intervention measures in the general population to address suspected mechanical obstruction of the airways. Educating and raising awareness adequately in the population is essential to prevent foreign body aspirations; parents must be made aware of the significant risk of aspiration and its high incidence in young children, and be acquainted with basic measures for its prevention.⁴⁻⁶

We should not forget that choking on a foreign body accounts for 40% of unintentional deaths in infants aged less than 1 year, and that the prevalence of hypoxic encephalopathy secondary to bronchial aspiration is also substantial.

Epidemiology

Episodes of foreign body aspiration usually happen in children aged less than 5 years, and the majority occur in patients aged less than 3 years (due to the absence of adequate teeth and immaturity in the coordination of swallowing). It is the second leading cause of death at home in children aged 1-3 years.^{7,8}

A review study by Jaswal and Jana⁹ referenced a 1995 study by Darrow and Holinger. After analysing multiple case series, these authors found that 84% of episodes occur before age 5 years and 73% before age 3 years. Of all episodes, 56.4% occurred in the 1-3 year group, and they underscored that there was an incidence of 6% in infants aged less than 1 year.

Other authors have also found a second incidence peak at 8-11 years of age with somewhat different characteristics (for example, aspirated objects tend to be of a different kind, for example, nonfood items).^{10,11}

When it comes to the distribution by sex, foreign body aspirations are slightly more frequent in males, as evinced in several studies.^{1,9,12,13}

As for the setting of aspiration episodes, most take place at home, and most cases of suffocation occur while the child is eating or playing, usually in the presence of another person.¹⁰

We ought to underscore the lack of awareness regarding this issue in households and even in schools. Thus, for example, it is typical for some nurseries and schools to celebrate "chestnut" or "nut" parties with the arrival of autumn that are meant for children to learn about, try and also become exposed to these foods. Needless to say, the presence of these foods in all types of celebrations, including birthday parties, is the norm.¹

As for the nature of the foreign body, and in Spain in particular, the items that are involved most frequently (60-80% of cases) are vegetables, nuts and seeds (especially peanuts and sunflower seeds). Other foods and a variety of inorganic objects (usually toy parts, balloons, pebbles, etc.) are involved less frequently.^{1-6,14} In this regard, a study conducted in the United States that analysed 17 537 episodes of nonfatal choking in children aged less than 14 years found that 59.5% were food-related, 31.4% nonfood-related, and the cause of 9.1% was unknown.¹²

When it comes to nonfood items, we ought to highlight very small objects (balls, marbles, springs, pins, etc.), and especially balloons, which adhere and conform to the shape of the airways and can lead to total obstruction (29% of fatalities due to nonfood-related choking involve balloons), something that can also happen with latex gloves.¹⁰

In terms of the location of the aspirated bodies, these are found most frequently in the right main bronchus, although the evidence shows that the difference in frequency between both main bronchi (right and left) is not as marked as in adults.

Different case series of children published in the literature have reported a proportion of foreign bodies found in the right main bronchus ranging between 48.6% and 55%, which differs from the distribution in adults, in whom this location is found in 65–70% of cases.^{1,2,7,11,15}

The true incidence of choking due to foreign body aspiration is actually not known, as most episodes resolve spontaneously without medical attention.^{10–13} In Spain, the incidence of episodes for which care is sought at the hospital is approximately 15 per 100 000 inhabitants aged less than 14 years, and food-related episodes are the most frequent type.¹ This incidence has remained stable through the years despite the measures undertaken, although there is variability between countries based on life style (celebrations and parties) and dietary habits.^{14–16}

Health education and the various preventive measures that have been implemented in relation to the manufacturing and labelling of toys and other objects that are part of children's lives, as well as compliance with pertinent regulations, have contributed to controlling the number of choking events, at least when it comes to nonfood foreign objects.

Still, the analyses performed by the European Child Safety Alliance¹⁷ show that while things have improved in Spain in recent years, there is still much left to do when it comes to implementing measures for preventing this type of accidents.

Foreign body aspiration at any level of the respiratory tract has, as we have explained, a considerable impact due to its frequency, severity, potential sequelae and of course the associated mortality, as reflected in various studies.

When it comes to mortality, it is believed that foreign body aspirations are responsible for 7% of all unintentional fatalities in children aged less than 4 years, and they caused 300 deaths in the United States in 1991 and 160 in 2001.^{2–7} In the United States, prior to the standardisation of bronchoscopy, the estimated mortality was 50%. Following improvements in endoscopic and anaesthetic materials and techniques, mortality has declined to nearly 1%.^{2,4,18} Nevertheless, it is estimated that in the United States, choking on food causes the death of one child every five days.¹²

We have also succeeded in decreasing mortality in Spain. In our country, mortality has been estimated to amount to 0.9% of the aspiration cases that are managed at the hospital level, a figure that is similar to that reported by other authors.¹ Unfortunately, this should be considered an underestimation of the overall percentage, as cases that result in

death prior to reaching the hospital are not usually included in the calculation.

In addition to technical improvements, decreases in mortality have also been achieved through the introduction of practice protocols, specifically through the clinical assessment of patients, the awareness of the problem of health care providers, and the indications for bronchoscopy (secondary prevention).¹⁰

The family's suspicion of foreign body aspiration, respiratory manifestations, auscultation and chest radiography are the main factors that lead to bronchoscopic examination and to the resolution of the problem. The strongest indication among these factors is the family's suspicion of an aspiration event.^{18,19} In fact, the clinical datum with the highest sensitivity and specificity is a history of choking, although the absence of such an episode does not rule out the possibility of aspiration; it has been described that in up to 20% of cases, parents did not witness or disregarded the choking episode.^{18,19}

Data from the Instituto Nacional de Estadística (National Institute of Statistics)²⁰ show that the overall mortality due to unintentional injury has been decreasing in the last 15 years, especially for road traffic accidents. However, the mortality due to foreign body aspiration has remained more or less stable during this period.

Preventive measures, especially at the primary care level, and strategies based on education and policy-making remain to be implemented in Spain, as can be gleaned from the data obtained by the European Child Safety Alliance.

Among other measures, this institution recommends policies requiring that warning labels include specific descriptions of the danger, which would be more effective than policies not requiring specific warnings. Furthermore, it considers that legislation is more effective when it is supported by educational interventions.

Strategies that have proven effective in the prevention of foreign body aspiration

The modification of products by means of legislation permanently eliminates a greater proportion of the risk of choking or strangulation than parental supervision, and is recommended for the safe design of cribs and carrycots and other products that carry a risk of child suffocation.²¹

Legislation mandating that warning labels in products include a specific description of the hazard is more effective than legislation that does not require warnings to be specific.^{21,22}

Another useful strategy is the enactment of policies banning unsafe products.^{21,23}

National policy²⁴

Royal Decree 820/1990 of June 22 prohibits the manufacturing and marketing of products of misleading appearance that may pose hazards to the health or safety of consumers. Article 1 clarifies that these products are those that, while not being edible, have a shape, smell, colour, appearance, presentation, labelling, volume or size such that it would be predictable for consumers, and particularly children, to

confuse them with food products and therefore to bring them to their mouths, lick them or ingest them, which carries the risk of suffocation, intoxication, or perforation or obstruction of the digestive tract.

Royal Decree 1468/1988, of December 2 approved the Regulation of labelling, presentation and advertising of industrial products destined for direct sale to consumers and end-users. Article 6 specifies the standards that must be met by the labelling, presentation and advertising of industrial products for direct use or consumption.

Last of all, in Royal Decree 1801/2003 on the general safety of manufactured products, Article 3 on the "Assessment of the safety of a product" specifies that when there is no applicable mandatory regulation, or the existing regulation does not cover all the risk categories of the product, the assessment of its safety will take into account the following elements, always ensuring the level of safety that can be reasonably expected by consumers:

- (a) National technical standards that derive from non-harmonised European standards.
- (b) UNE standards.
- (c) Any recommendations of the European Commission that establish guidelines on product safety assessment.
- (d) Current good manufacturing practices in the sector, especially when consumers and the public administration have participated in their development and approval.
- (e) Current knowledge and technology.

In Royal Decree 1205/2011 of August 26 on toy safety, Appendix II, "Specific safety requirements", *bans toys that are tightly bound to a food* at the time of consumption such that the food must be consumed to gain access to the toy. It also specifies that toy parts that are directly bound to the food must have a size such that they do not pose a choking hazard. Furthermore, toys and toy parts designed for the use of children aged less than 36 months should have dimensions such that preclude their swallowing or aspiration.

In Royal Decree 1205/2011 of August 26 on toy safety, Appendix V, "Warnings", details the *specific warnings and recommended precautions* that must be used for certain toy categories and specifies that:

- User restrictions will include at least the minimum or maximum age of toy users.
- Toys designed to be suspended over a crib, playpen or stroller by means of strings, cords, elastic bands or straps should be packaged with the following warning, which should be permanently affixed to the toy: "To prevent potential injury due to strangulation, this toy should be removed once the child starts trying to stand up using the support of hands and knees."
- Toys distributed or mixed with foods should carry the following warning: "Contains a toy. Adult supervision recommended."

Regulation (EC) no 765/2008 of the European Parliament and of the Council of 9 July 2008 set out the requirements for accreditation and market surveillance relating to the marketing of products. These requirements also apply to the

toy sector. According to Royal Decree 1205/2011 of August 26 on toy safety, latex balloons fall within the scope of this standard.

The UNE-EN 71 standard on toy safety specifies that the packaging of latex balloons must carry a warning that they are made of latex to prevent potential allergic reactions and also include the following text: "WARNING: children under eight years can choke or suffocate on uninflated or broken balloons. Adult supervision required. Keep uninflated balloons from children. Discard broken balloons at once."

We did not find policies

- Regarding mandatory printing of warnings in plastic bags to prevent suffocation.
- Mandating that labels include warnings on the potential hazard posed by the administration of nuts and seeds to young children, similar to the legislation that pertains to the labelling of certain toys. The packaging of these products (nuts and seeds) does sometimes include warnings of the actual danger that they may pose to younger children, but this is seldomly the case.

Recommendations of the Committee on Safety and Prevention of Unintentional Injuries in Childhood

This is a crucial issue, as it is in other fields of Paediatrics. Primary and secondary prevention measures need to be implemented.¹⁰

We believe that at present, primary prevention is the key area in the fight against this problem.

We propose adequate, legally-mandated labelling warning the population of the hazards of nuts and seeds similar to the labelling found in toys with small parts.

We propose launching educational campaigns targeting different sectors to raise awareness in the general population, health care providers, child care workers and other individuals associated with children in any capacity regarding the risk of giving children of certain ages certain foods or certain toys or objects, as they can pose a serious danger and even be fatal to them.

Preventive measures should target every group that interacts with children regularly (teachers, health care providers, etc.) and above all, parents.

Paediatricians ought to warn parents of the dangers of foreign body aspiration and thus should

Foods.

- Recommend that children aged less than 4–5 years should not be given foods that could make them choke. This mainly refers to nuts and other dried snacks: popcorn, almonds, walnuts, sunflower seeds, corn, etc.
- Recommend avoiding hard foods, such as candy and other sweets, in this age group, as they could be particularly dangerous.
- Emphasise the need of cutting soft and round foods, such as grapes and sausages, lengthwise before serving them to children.

- Advise against making young children laugh or cry while they are eating.
- Suggest teaching children to chew slowly and correctly.
- In particular, teach children to eat nuts and similar snacks one by one (as opposed to in handfuls) and chewing them thoroughly.
- Recommend teaching children to eat while seated. Children should never run or play during meals.
- Keep from feeding children foods that contain small objects, such as the popular sweets that have a toy inside.
- Watch children when they eat.

Toys and other objects.

- Insist on the need to heed warning labels in toys and other products that children may encounter. Follow the age recommendations printed in the packaging of toys.
- Recommend that balls used by children to be larger than golf balls.
- Ensure that all toys used by children bear the CE mark.
- Try to keep children from playing with objects that are small (buttons, screws, game chips, etc.) or have parts that are easily disassembled, and with balloons or latex gloves.
- Recommend teaching older children to keep toys with small parts out of reach of younger siblings.
- Remind that any broken toys should be discarded.
- Propose the inspection of floors and low places for the potential presence of small objects, such as buttons, marbles, coins, pins, pebbles or screws, objects that can be easily disassembled, or latex gloves and balloons.
- Keep cribs or children's beds free of soft toys and objects, especially toys with strings or small parts. Refrain from placing shades, curtains or decorative mobiles over cribs.
- Storing bags or other plastic wrapping or containers out of the reach of children.
- Supervise children during play.

Conflict of interests

The authors have no conflict of interests to declare.

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