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Guidelines

Foreign body and caustic ingestions in children: A clinical practice guideline

Salvatore Oliva[a,*], Claudio Romano[b], Paola De Angelis[c], Sara Isoldi[d], Cecilia Mantegazza[e], Enrico Felici[f], Emanuele Dabizzi[g], Giorgio Fava[h], Sara Renzo[i], Caterina Strisciuglio[j], Paolo Quitadamo[k], Marco Deganello Saccomani[l], Matteo Bramuzzo[m], Paolo Orizio[n], Giovanni Di Nardo[o], Francesco Bortoluzzi[p], Maristella Pellegrino[q], Maria Teresa Illiceto[r], Filippo Torroni[c], Fabio Cisarò[s], Angelo Zullo[t], Francesco Macchini[h], Federica Gaiani[u], Alessandro Raffaele[v], Barbara Bizzarri[u], Serena Arrigo[w], Gian Luigi de' Angelis[u], Massimo Martinelli[x], Lorenzo Norsa[y], on behalf of the Italian Society of Pediatric Gastroenterology Hepatology and Nutrition (SIGENP), and The Italian Association of Hospital Gastroenterologists and Endoscopists (AIGO)

[a] *Maternal and Child Health Department, Pediatric Gastroenterology and Liver Unit, Sapienza - University of Rome, Rome, Italy*
[b] *Pediatric Gastroenterology and Cystic Fibrosis Unit, Department of Human Pathology and Pediatrics, University of Messina, Italy*
[c] *Digestive Surgery and Endoscopy Unit, Bambino Gesù Children's Hospital, IRCCS, Rome, Italy*
[d] *Maternal and Child Health Department, Sapienza - University of Rome, Santa Maria Goretti Hospital, Polo Pontino, Latina, Italy*
[e] *Pediatric Gastroenterology and Digestive Endoscopic Unit, Department of Pediatrics and Pediatric Surgery, University of Milan, Buzzi Children's hospital, Italy*
[f] *Pediatric and Pediatric Emergency Unit, "Umberto Bosio" Center for Digestive Diseases, The Children Hospital, AO SS Antonio e Biagio e Cesare Arrigo, Alessandria, Italy*
[g] *Gastrointestinal and Interventional Endoscopy Unit, Surgical Department, AUSL Bologna, Bologna, Italy*
[h] *Department of Pediatric Surgery, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy*
[i] *Gastroenterology and Nutrition Unit, Meyer Children's Hospital, Florence, Italy*
[j] *Department of Woman, Child and General and Specialistic Surgery, University of Campania "Luigi Vanvitelli", Naples, Italy*
[k] *Department of Pediatrics, A.O.R.N. Santobono-Pausilipon, Naples, Italy*
[l] *Department of Pediatrics, Woman's and Child's University Hospital of Verona, Italy*
[m] *Pediatric Gastroenterology, Digestive Endoscopy and Clinical Nutrition Unit, Department of Pediatric, Institute for Maternal and Child Health IRCCS "Burlo Garofolo", Trieste, Italy*
[n] *Department of Pediatric Surgery, Spedali Civili Children's Hospital, Brescia, Italy*
[o] *NESMOS Department, Sapienza University of Rome, Sant'Andrea University Hospital*
[p] *Gastroenterology Unit, ULSS 12, Venice, Italy*
[q] *Pediatric Surgery Unit, Maternal and Child Department, ASST GOM of Niguarda, Milan, Italy*
[r] *Pediatric Gastroenterology and Digestive Endoscopic Unit, Department of Pediatrics, "Santo Spirito" Hospital of Pescara, Italy*
[s] *Pediatric Gastroenterology Unit, Regina Margherita Children's Hospital, Azienda Ospedaliera-Universitaria, Città della Salute e della Scienza di Torino, Turin, Italy*
[t] *Gastroenterology and Digestive Endoscopy, 'Nuovo Regina Margherita' Hospital, Rome, Italy*
[u] *Gastroenterology and Endoscopy Unit, University Hospital of Parma, University of Parma, Parma, Italy*
[v] *Pediatric Surgery Unit, Department of Maternal and Child health, IRCCS Policlinico San Matteo Pavia and Department of Clinical-Surgical, Diagnostic and Pediatric Science, University of Pavia, Italy*
[w] *Pediatric Gastroenterology and Endoscopy Unit, Institute Giannina Gaslini, Genoa, Italy*
[x] *Department of Translational Medical Science, Section of Pediatrics, University of Naples "Federico II", Naples, Italy*
[y] *Pediatric Hepatology Gastroenterology and Transplantation, ASST Papa Giovanni XXIII, Bergamo, Italy*

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ABSTRACT

Foreign body and caustic ingestions in children are usually the most common clinical challenges for emergency physicians, general pediatricians and pediatric gastroenterologists.

* Address correspondence to: Salvatore Oliva, Pediatric Gastroenterology and Liver Unit, Maternal and Child Health Department, Sapienza University of Rome, Viale Regina Elena 324 - 00161 Roma –Italy.
E-mail address: salvatore.oliva@uniroma1.it (S. Oliva).

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Management of these conditions often requires different levels of expertise and competence.

Endoscopy is often necessary but there is a high risk of misusing this tool with incorrect timing and indications. The imprecise clinical history frequently leaves clinicians uncertain about timing and nature of the ingestion. Few clinical guidelines regarding management of these ingestions in children have been published, none of which from the Italian Society of Pediatric Gastroenterology, Hepatology and Nutrition (SIGENP). An expert panel of Italian endoscopists was convened by the SIGENP Endoscopy Working Group to produce the present article that outlines practical clinical approaches to the pediatric patient with a variety of foreign body and caustic ingestions. The Italian Association of Hospital Gastroenterologists and Endoscopists (AIGO) has also endorsed the project since many adult endoscopists usually manage children with these conditions. Differently from the other published guidelines, the proposed one focuses on the role of the endoscopists (regardless of whether they are adult or pediatric gastroenterologists) in the diagnostic process of children with foreign body and caustic ingestions.

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Introduction

Characteristically, children unintentionally ingest objects or substances within reach, most commonly in the household. Both caustic and foreign body (FB) ingestions result in significant morbidity, mortality, and health care utilization. Up to 75% of the total ingestions usually occur in children 5 years of age or younger, with higher risks of complications and mortality.

It is the responsibility of general pediatricians as well as pediatric gastroenterologists to prevent and manage these ingestions. Despite its relevance in daily clinical practice, only a few guidelines specifically written for the pediatric setting have been published, none of which from the Italian Society of Pediatric Gastroenterology, Hepatology and Nutrition (SIGENP). Despite the presence of European recommendations on the most serious conditions (i.e. button battery ingestions or food bolus impactions), every country has a different setting and management in the emergency department according to the local availability, regulation and expertise. A recent survey published by the SIGENP has reported that almost 1/3 of the total endoscopies in children is performed by adult endoscopists, especially where an emergency pediatric endoscopy service is lacking (around 30% of sites)[1].

The present guideline aims to support pediatric and adult gastroenterologists in managing children with foreign body or caustic ingestions. Apart from the necessity to develop a national guideline, differently from the other published guidelines, the proposed one focuses on the role of the endoscopists (regardless of whether they are adult or pediatric gastroenterologists) in the diagnostic process of children with foreign body and caustic ingestions. By identifying and describing the recommended interventions, these practice guidelines are not intended as fixed protocols or a substitute for the advice of professional health care providers.

Methods

In May 2019 the SIGENP Endoscopy Working Group (WG) supported by the Italian Association of Hospital Gastroenterologists and Endoscopists (AIGO), appointed a panel of experts, with the aim to prepare a clinical practice guideline to support general pediatricians and endoscopists in the management of children with foreign body and caustic ingestions.

The chair and secretary of the SIGENP Endoscopy WG (SO and LN) identified the following main tasks: 1) general consideration and equipment; 2) foreign bodies; 3) food impaction; 4) caustic ingestions. The specific tasks carried out by the panel members are reported in the Supplementary File 1 herewith provided.

Key questions were developed following the PICO format[2] and voted. A PubMed/EMBASE search for English-written articles, with no time limits and using appropriate MeSH terms (Supplementary File 1) was performed. Regular conference calls, web-based exchanges and two intermediate meetings were scheduled. The levels of evidence and recommendations were defined for every part of the statement according to the GRADE system[3]. The working parties then met twice in 2019 (Rome and Verona) to revise and develop agreement with the statements. Each statement was revised until consensus was reached. The panel then voted on all recommendations and practice points, while adding specific comments using a web-based voting platform. The document was revised again based on comments received. A second round of electronic voting and revisions was done. The Consensus Statement was reached at >80% participant agreement. The guideline includes not only recommendations but also "practice points" that reflect common practice wherein evidence is lacking. Weaker recommendations are indicated by phrases such as "we suggest", whereas stronger recommendations are typically stated as "we recommend". Recommendations are intended to be read in context with the qualifying comments in the accompanying text. Each working group provided a summary of written background evidence for statements to draft the initial manuscript by SO. The manuscript was circulated to the consensus group for revisions before submission for publication.

1. General considerations and equipment

Q1: What are endoscopy urgency levels in children?
Recommendation:

1.1. We recommend performing an endoscopy according to the following urgency levels:

- **emergency (<4 hrs)**
- **urgency (<24 hrs)**
- **early elective (< 48 hrs)**
- **elective (> 48 hrs)**

[strong recommendation, moderate quality of evidence]
[Vote result: Strongly agree: 56%; agree: 44%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

Summary of evidence

A pediatric endoscopic service with 24 hrs access is not available everywhere in Italy[1]. Therefore, the access modality to an emergency endoscopy (direct access, referral from another center) and consequently the timing of the procedure may vary. An urgent endoscopy should be performed in an adequate setting, by dedicated and experienced personnel, and within a range of time between < 2 h and <24 hrs from the acute event. Occasionally endoscopy can be performed after up to 48 h[4,5]. A 24-hour on-call service for emergency pediatric endoscopy reduces the waiting time and ensures higher efficacy with reduction of possible complications[6]. The optimal timing of the endoscopic procedure might

Table 1
Suggested retrieval devices.

Object type	Appropriate retrieval devices
Blunt objects	Grasping forceps, retrieval graspers, polypectomy snare, basket, retrieval net
Sharp-pointed objects	Grasping forceps, polypectomy snare, basket, retrieval net Transparent cap, latex rubber hood
Long objects	Polypectomy snare, basket
Food bolus	Grasping forceps, retrieval graspers, polypectomy snare, basket, retrieval net

be influenced by numerous factors: 1) patient's condition and stabilization; 2) availability of the endoscopic or operating room 3) availability of the anesthesiologist and endoscopic team; 4) transfer time to a tertiary referral center.

Considering all these features, we can define this intervention timing[5]: emergency, urgency, early elective and elective.

Q2: Which sedation protocol is most appropriate for an emergency endoscopy?

Recommendation:

1.2. We recommend performing an emergency endoscopy under general anesthesia with airways protection, especially for foreign body ingestion and food bolus impaction

[strong recommendation, moderate quality of evidence]
[Vote result: Strongly agree: 56%; agree: 44%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

Summary of evidence

Pediatric endoscopy always requires an adequate sedation provided by a dedicated staff. Smaller and more compliant airways of children lead to a higher risk of obstruction during endoscopy. General anesthesia with endotracheal intubation gives full airway protection, which often represent the ideal in most emergency procedures in children. Since foreign body ingestions and food bolus impactions are usually the more complicated and longer emergencies, the choice of general anesthesia makes the procedure safer for both patients and endoscopists[7,8].

Q3: How many staff units should be included in the emergency endoscopy team?

Recommendation:

1.3. The emergency endoscopy team should include a trained endoscopist, a dedicated anesthetist, and one or more qualified nurses

[strong recommendation, moderate quality of evidence]
[Vote result: Strongly agree: 76%; agree: 24%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

Summary of evidence

Emergency endoscopy should be performed by a trained endoscopist, familiar with a wide range of tools for removing FBs[5].

At least one qualified nurse with one or more members of the endoscopy team should assist the main operator. The nursing staff need to have a specific set of pediatric skills[6,9,10].

Q4. Which are the minimal instrumentation and accessories necessary in an emergency endoscopy service?

Practice Point:

At least two endoscopes (<6 mm *and* standard adult gastroscope*) of different diameters can represent the minimal instrumentation for an emergency endoscopy service. Retrieval forceps, retrieval nets, polypectomy snares, endoscopic baskets and overtubes might be considered as possible useful accessories.*

Summary of evidence

There are not enough data to determine the minimal instrumentation needed by an emergency endoscopy service in children. In adults, 1 gastroscope per 350 procedures/year is required. In pediatric endoscopy at least two endoscopes with various insertion diameters might be necessary for both infants and children[10].

For children aged <1 year or <10 kg, a gastroscope < 6 mm is preferred, for children older than 1 year or weighing more than 10 kg a standard adult gastroscope can be used[11]. There are no studies in children on the efficacy of different retrieval devices or overtubes. Retrieval devices are usually selected based on the shape and size of the foreign body's or the endoscopists' preference (Table 1). Devices might include alligator and rat-tooth forceps, retrieval nets, polypectomy snares, tripod forceps, and baskets. Latex cones and overtubes are beneficial in case of sharp foreign bodies. Endoscopic baskets may be useful for round objects, whereas retrieval nets can provide a safer grasp for coins, batteries, magnets or food boluses[7,12,13].

Foreign body ingestions

Foreign body ingestions in children are common, especially under the age of 6 years. In 2015, the FBs ingestions rate was 17,9 cases per 10.000 children in the United States. Coins (61,7%) were the most frequently ingested objects, followed by toys (10,3%), jewelry (7%) and batteries (6,8%)[14].

Although updated data are unavailable in Italy there might be a comparable rate.

Many FBs spontaneously pass through the gastrointestinal (GI) tract, but an endoscopic removal may be necessary to prevent severe complications. FB characteristics and location, timing of the ingestion, and age are determining factors to assess the risk of complications[15].

Q1: What should be the initial assessment and management of a child with suspected foreign body ingestion in the Emergency Department?

Recommendation:

2.1. A detailed medical history including type and size of the object, time since the ingestion, last meal and presence of pre-existing diseases should be obtained. Presence of symptoms, location and type of foreign body determine the urgency level whereas in case of complication signs at the physical examination (i.e. esophageal damage, occlusion and/or perforation) endoscopy is not indicated.

[strong recommendation, high quality of evidence]
[Vote result: Strongly agree: 72%; agree: 28%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

Summary of evidence

In emergency situations with compromised vital signs, an ABC resuscitation must be applied before any other intervention[15]. In stable patients, a detailed medical history should be collected (circumstances and timing of ingestion, onset of symptoms, type and size of FB, pre-existing gastrointestinal medical conditions and timing of last meal)[11,15]. It is particularly important to define if the ingestion has been witnessed or not[16].

Objects can be classified in: blunt foreign bodies (i.e. coins), sharp-pointed objects (i.e. pins, tacks, nails, toothpicks, hairpins), toxic objects (i.e. batteries, lead containing objects, drug packets) and magnets[11].

Blunt FBs with diameter ≥ 2 cm in patients younger than 1 year or ≥ 3 cm in children older than 1 year are unlikely to pass the pylorus. The same applies for FBs > 6 cm in length that should be

considered for removal[17]. All these data are necessary to establish the need for a consultation with the on-call endoscopist.

Symptoms are usually determined by FB type, size and location along the GI tract.

Dysphagia, odynophagia, drooling, retrosternal pain or retching suggest an esophageal FB. Gastric FBs usually do not cause important symptoms. Sharp objects and disk batteries may also cause gastrointestinal bleeding or perforation. Bulky FBs may lead to gastrointestinal obstruction[16].

Physical examination is fundamental to look for complications requiring a surgical management (i.e. obstruction or perforation)[17,18]

Q2. What diagnostic imaging investigations should be performed in a child with suspected foreign body ingestion in the Emergency Department?

Recommendation:

2.2. Biplane radiographs are recommended in all patients with known or suspected foreign body ingestions, even in the absence of symptoms. Radiocontrast examination is suggested for radiolucent bodies. Radiological examinations should not delay an urgent endoscopy in any case.

[moderate recommendation, high quality of evidence]

[Vote result: Strongly agree: 48%; agree: 40%, neutral: 4%, disagree: 8%, strongly disagree: 0%]

Practice Points:

- *A twin object can be useful to measure the FB size and to test its radiodensity. It is also useful to identify the best device for endoscopic removal.*
- *The X-ray examination should be performed 30* min *before the procedure. In case of postponed endoscopy, the X-ray exam should be repeated to confirm that the FB is still removable by endoscopy (not beyond the ligament of Treitz).*

Summary of evidence

Radiopaque or unknown FBs should be initially investigated with a biplane radiography (including neck, chest, abdomen and pelvis) to assess their number, location, size, and shape[19]. Radiography also allows to exclude complications (i.e. aspiration, perforation)[20].

The use of contrast agents is controversial in radiolucent FBs. Barium swallow is not recommended because it may interfere with the endoscopic removal by coating FBs. A water-soluble radiocontrast (i.e. lopamidol) may be used, except in proximal esophageal obstruction because of the aspiration risk. In any circumstances, radiocontrast examinations should not delay an endoscopy[21].

CT scan can be considered for radiolucent FBs in selected cases by balancing the risk of X-ray exposure and the exam necessity. There is not sufficient evidence supporting the use of metal detector, ultrasonography or magnetic resonance[12].

Q3. When should the E.R. doctor contact the on-call endoscopist?

Recommendation:

2.3.1. We recommend contacting the on-call endoscopist in esophageal or symptomatic gastric foreign body retentions, and in any case of sharp objects, disk batteries and multiple magnets ingestion.

[*strong recommendation, moderate quality of evidence*]

[Vote result: Strongly agree: 60%; agree: 36%, neutral: 4%, disagree: 0%, strongly disagree: 0%]

2.3.2. We suggest discharging patients with asymptomatic gastric retention of non-sharp or non-disk battery foreign bodies, and to follow them up with serial X-Rays.

[*strong recommendation, moderate quality of evidence*]

[*Vote result*: *Strongly agree*: 64%; *agree*: 36%, *neutral*: 0%, *disagree*: 0%, *strongly disagree*: 0%]

Practice Point:

- *Emergency doctors may attempt to stimulate the passage to the stomach for asymptomatic small blunt FB in the distal esophagus, by asking to swallow water and monitoring patients for up to 24 hrs in the ER before endoscopy.*

Summary of evidence:

After detailed medical history, physical assessment and imaging studies patients can be referred to the on-call endoscopist (Fig. 1). Esophageal disk battery represents a life-threatening condition and obliges to an immediate consultation with endoscopists and surgeons[11,22–24] (see "Disk Batteries "section).

FB location of sharp-pointed objects should be rapidly defined by imaging. Complications seem more common in symptomatic patients, while they are likely delayed in the asymptomatic ones. An early consultation with the endoscopist is thus necessary[25]. A single magnet is usually not harmful, while multiple ingestions or ingestions of one magnet with other metallic FBs can lead to severe complications by trapping portions of bowel wall[26].

Esophageal FBs almost always require an endoscopy[19]. Proximal esophageal blunt FBs causing a near-complete esophageal obstruction and/or respiratory symptoms should be emergently considering the higher adverse events risk (i.e. aspiration).

In clinically stable patients without symptoms of esophageal obstruction, small blunt FBs (i.e. coins) in the distal esophagus may not require emergency endoscopy because they are likely to pass spontaneously into the stomach[17]. A spontaneous clearance can occur in approximately 30% to 60% of cases, more likely in the case of coins stuck in the distal esophagus[27,28]. However, non-proximal esophageal FBs should be removed within 24 hrs from the ingestion, as any delay decreases the likelihood of successful removal and increases the risk of adverse events (i.e. perforation).

Once FBs passed the esophagus, most objects are expelled within 4 weeks. In asymptomatic patients with blunt and small FBs in the stomach (except batteries and magnets) an outpatient management is appropriate. Caregivers should be instructed to recognize symptoms and signs of complications and monitor the stools until FB passage[29–33]

Hospital admission and observation are recommended in case of unclear medical histories or symptoms, in potentially harmful radiopaque FB already located in the duodenum, or in radiolucent potentially damaging objects not detected by the endoscopic exam[34].

Q4. In children with foreign body ingestion what should be the most appropriate timing for endoscopic removal?

Recommendations:

2.4.1 The following timing is recommended for foreign bodies in the ESOPHAGUS:

emergency:

- sharp-pointed foreign bodies
- proximal blunt foreign bodies and food bolus causing complete esophageal obstruction (i.e. inability to manage secretions) and/or respiratory symptoms
- disk batteries (< 2 hrs; see specific section)

urgency:

- asymptomatic or mildly symptomatic blunt foreign bodies
- food bolus without complete esophageal obstruction

[strong recommendation, moderate quality of evidence]

[Vote result: Strongly agree: 52%; agree: 44%, neutral: 4%, disagree: 0%, strongly disagree: 0%]

Fig. 1. Initial management of a child with foreign body (FB) ingestion.

2.4.2 The following timing is recommended for foreign bodies in the STOMACH:

emergency:

- sharp-pointed foreign bodies
- disk batteries in children <5 years old

urgency:

- blunt foreign bodies causing symptoms
- disk batteries in asymptomatic patients and/or in >5years old

elective:

- objects > 2.5 cm of diameter or >6 cm in length in asymptomatic patients
- blunt foreign bodies failing to pass spontaneously after 4 weeks

[low recommendation, low quality of evidence]
[Vote result: Strongly agree: 36%; agree: 36%, neutral: 12%, disagree: 16%, strongly disagree: 0%]

2.4.3 The following timing is recommended for foreign bodies in the DUODENUM:

emergency:

- sharp-pointed foreign bodies
- blunt foreign bodies causing symptoms

elective:

- blunt foreign bodies failing to pass spontaneously after 4 weeks

[strong recommendation, low quality of evidence]
[Vote result: Strongly agree: 44%; agree: 48%, neutral: 4%, disagree: 4%, strongly disagree: 0%]

2.4.4 An ileocolonoscopy is recommended with the following timing and indications:

urgency:

- retrogradely inserted blunt foreign bodies failing to pass spontaneously

elective:

- blunt foreign bodies failing to pass spontaneously the colon

[strong recommendation, low quality of evidence]
[Vote result: Strongly agree: 36%; agree: 60%, neutral: 4%, disagree: 0%, strongly disagree: 0%]

Practice Points

Table 2
Timing of endoscopy depending on location and type of the foreign body.

	ESOPHAGUS	STOMACH	DUODENUM
Disk batteries	**EMERGENCY** (< 2 hours)	**EMERGENCY** *if symptomatic, or in children < 5 years, or in concomitant magnets or multiple DB ingestions*	**EMERGENCY** *if symptomatic*
		URGENCY *asymptomatic children > 5 years*	
Sharp-pointed foreign bodies	**EMERGENCY**	**EMERGENCY**	**EMERGENCY**
Blunt foreign bodies	**EMERGENCY** *If proximal and causing esophageal obstruction and/or respiratory symptoms*	**EMERGENCY** *if symptomatic*	**EMERGENCY** *if symptomatic*
	URGENCY	**URGENCY** *Foreign bodies > 2.5 cm in diameter or >6 cm*	**URGENCY** *Multiple magnets or single magnet with another metallic object*
		ELECTIVE *Blunt foreign bodies not passing within 4 weeks*	**ELECTIVE** *Foreign bodies > 2.5 cm in diameter or >6 cm Blunt foreign bodies not passing within 4 weeks*
Magnets*	**URGENCY**	**URGENCY**	**URGENCY**
Food bolus	**EMERGENCY** *if unable to manage secretions*		
	URGENCY		

- *Timing of FBs removal depends on type, size and location of FB as well as on child's clinical conditions (asymptomatic vs symptomatic)*

Summary of evidence:

A detailed description of endoscopy timing is reported in Table 2.

Endoscopy timing depends on clinical status, FB type (blunt or sharp-pointed) and location, as well as the last mealtime. Esophageal disk batteries and sharp-pointed FBs are the most dangerous conditions and need an emergency removal[4,35] (see "Button batteries" section below). Sharp-pointed objects generally include nails, pins, toothbrushes or fish bones, but not plain glass fragments. They should be timely removed if reachable by endoscopy to avoid distal migration and/or bowel perforation[4]. Overtubes, transparent caps or latex rubber hoods are recommended to protect the mucosa from laceration during retrieval[24].

Blunt objects (mostly coins) require emergency removal in case of complete proximal esophageal obstructions or severe symptoms (i.e. respiratory distress, inability to manage secretions, severe pain). In asymptomatic or mildly symptomatic patients, esophageal FB should be removed within 24 hrs[4]. A confirmatory X-Ray before performing endoscopy is suggested to check if the FB has spontaneously passed thus avoiding unnecessary procedures.

Asymptomatic FBs in stomach and duodenum should be electively removed only in the case of objects unable to pass (likely with diameter ≥ 2 cm in patients younger than 1 year, ≥ 3 cm in older children, or length >6 cm)[36].

An endoscopic removal may be attempted in case of blunt FBs located in the distal rectum. Potentially harmful FBs failing to pass the rectum require surgery[11].

Magnets

Q5. In children with magnets ingestion what should be the most appropriate endoscopy timing for removal?

Recommendation:

2.4.5 An urgency removal of magnets is recommended if they are multiple or were ingested with other metallic foreign bodies.

[strong recommendation, low quality of evidence]

[Vote result: Strongly agree: 44%; agree: 52%, neutral: 4%, disagree: 0%, strongly disagree: 0%]

Practice Point:

- Particular attention to X-ray is recommended as multiple magnets can appear as one

Summary of evidence

The formidable attractive force of ingested magnets can cause ischemia, perforation, fistula, volvulus on the bowel wall. Single magnets should be considered like any other blunt FB[11]. Multiple magnets may stick together appearing as a single FB on X-ray, thus a thorough radiological evaluation is mandatory to avoid misdiagnosis. In case of adherent magnets, recommendations for multiple ingestion should be applied[4]. Some authors suggest endoscopic removal even in some single magnet ingestions to prevent complications[4,12,37].

Multiple magnets or ingestions of a single magnet with another metallic foreign body mandate an urgengent endoscopic removal either in the upper or the lower gastrointestinal tract.

Magnets localized between the ligament of Treitz and the proximal terminal ileum require a clinical and radiological follow-up. The use of small bowel enteroscopy is controversial.

An early consultation with pediatric surgeons is advisable, as symptoms of complications may be subtle or unspecific.

Disk Batteries (DB)

Q6. In children with disk battery ingestions what should be the most appropriate endoscopy management?

Recommendations:

2.4.6 We strongly recommend removing disk batteries from the esophagus within 2 hrs. In case of alarm symptoms (particularly bleeding) or unstable patients the procedure must be performed in operating room with the assistance of pediatric and cardiovascular surgeons to prevent and timely manage life-threatening complications. An early referral to a tertiary endoscopy center is recommended in case of unavailability of the abovementioned setting for removal.

[strong recommendation, moderate quality of evidence]

[Vote result: Strongly agree: 68%; agree: 32%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

2.4.7 It is suggested to emergently remove disk batteries from the stomach in symptomatic patients, in children <5years, in case of concomitant magnets or multiple DB ingestion.

[strong recommendation, moderate quality of evidence]

[Vote result: Strongly agree: 59%; agree: 38%, neutral: 0%, disagree: 3%, strongly disagree: 0%]

Practice Points:

- *Most DB ingestions are asymptomatic at the time of presentation. Despite a negative history of ingestion, pediatricians should also maintain a high level of suspicion for an esophageal DB in young children with abrupt onset of any one of the following: refusal of oral intake, difficulty swallowing, upper GI bleeding, chest pain, drooling, airway obstruction, or wheezing or stridor without typical prodromal symptoms of viral illness.*
- *DB ingestion should be suspected in every child with an ingestion history of rounded FBs. Radiographic signs of DB ingestions (*i.e. *"step sign" or "double outline sign") should be carefully checked at X-ray.*
- *Every emergency endoscopy service should implement a specific work-up for DB ingestions with a team including anesthesiologists, radiologists, pediatric and vascular surgeons. In case of unavailability of one or more specialists a referral plan to another unit must be implemented with the emergency department.*
- *Asymptomatic, stable patients with acute battery ingestion (*i.e. *witnessed or likely to have occurred within 1 to 2 hrs) should be fed honey or oral sucralfate until the battery is removed.*
- *Symptomatic children with a delayed diagnosis of battery impaction (*i.e. *uncertain timing of ingestion or symptoms of serious esophageal injury or mediastinitis, such as fever or chest pain) should have no oral intake prior to battery removal.*
- *After 2 hrs from the ingestion or in uncertain ingestion timing, a careful evaluation is required to determine the safest setting for removal of esophageal disk batteries in asymptomatic children. Emergent removal in the operating room with surgeons present and prepared to perform a thoracotomy represents the safest option. Several factors (longer time from the ingestion, age <5 years, impaction on the aortic arch, negative pole orientation, battery size >12 mm) can be associated with higher risks of life-threating complications and likely require a surgery-assisted approach. The final choice should be based upon the approach that can accomplish removal in the timeliest and safest fashion according to local availability and expertise.*
- *In case of sentinel bleeding with a DB in stomach, possible vascular anomalies or esophago-aortic fistulas should be excluded by CT-angiography.*
- *During endoscopy, it is important to note the battery orientation in the esophagus, in particular if the negative pole (side without the "+" and without the imprint) faces posteriorly, since this seems to be more frequently associated with the risk of esophageal-aortic fistula development. If possible, pushing an esophageal battery into the stomach should be avoided as the risk of esophageal perforation may increase.*

Summary of evidence

A detailed description of the endoscopic management of DB is reported in Fig. 2 (A-B).

DB lodged in the esophagus may cause serious injuries within 2 hrs, thus an extremely rapid referral to the emergency department (ED) is mandatory[23].

The administration of 10 ml of honey every 10 min (for up to 6 doses), while en route to the ED, may slow the occurrence of esophageal lesions by coating the battery[35].

Once in the ED, bleeding symptoms and signs as well as hemodynamic status should be rapidly evaluated. Both AP and lateral X-rays must be immediately obtained to locate the battery and determine the negative pole orientation (smaller diameter side), usually causing more severe lesions. A multidisciplinary approach involving endoscopist, cardiac/vascular surgeon, pediatric surgeon, anesthetist and radiologist may be necessary[38]. Every emergency endoscopy service should implement a specific work-up for DB ingestions by setting up a team including anesthesiologists, radiologists, pediatric and vascular surgeons. In case of unavailability of one or more specialists a referral plan to another unit must be implemented with the emergency department (Fig. 2A).

In presence of "sentinel" bleeding (previous hematemesis/melena, acute anemia, hemodynamic instability) in esophageal DB, or in active bleeding (regardless of DB location), patients should be evaluated in the operating room by endoscopists, pediatric and vascular surgeons. An exploratory thoracotomy followed by an intraoperative endoscopy is necessary to evaluate esophageal lesions before removing the DB[38,39] (Fig. 2B).

In patients with DB in the stomach and sentinel bleeding, a CT angiography is needed to assess the vascular involvement (i.e. aorto-esophageal fistula, presence of abnormal vessels, other), requiring the same approach as esophageal DB. Once a vascular involvement has been excluded, endoscopy can be performed to remove the DB and assess the damage, but always in the operating room[38,39]. A post-removal endoscopic and radiological follow-up is necessary to monitor the possible delayed complications.

Esophageal DBs without alarm symptoms require an emergency endoscopy in the operating room. However, management of this specific condition has awakened a wide and earnest discussion among panel members, due to some deaths which occurred in Italy over the last years[40]. The discussion mainly focused on pediatric

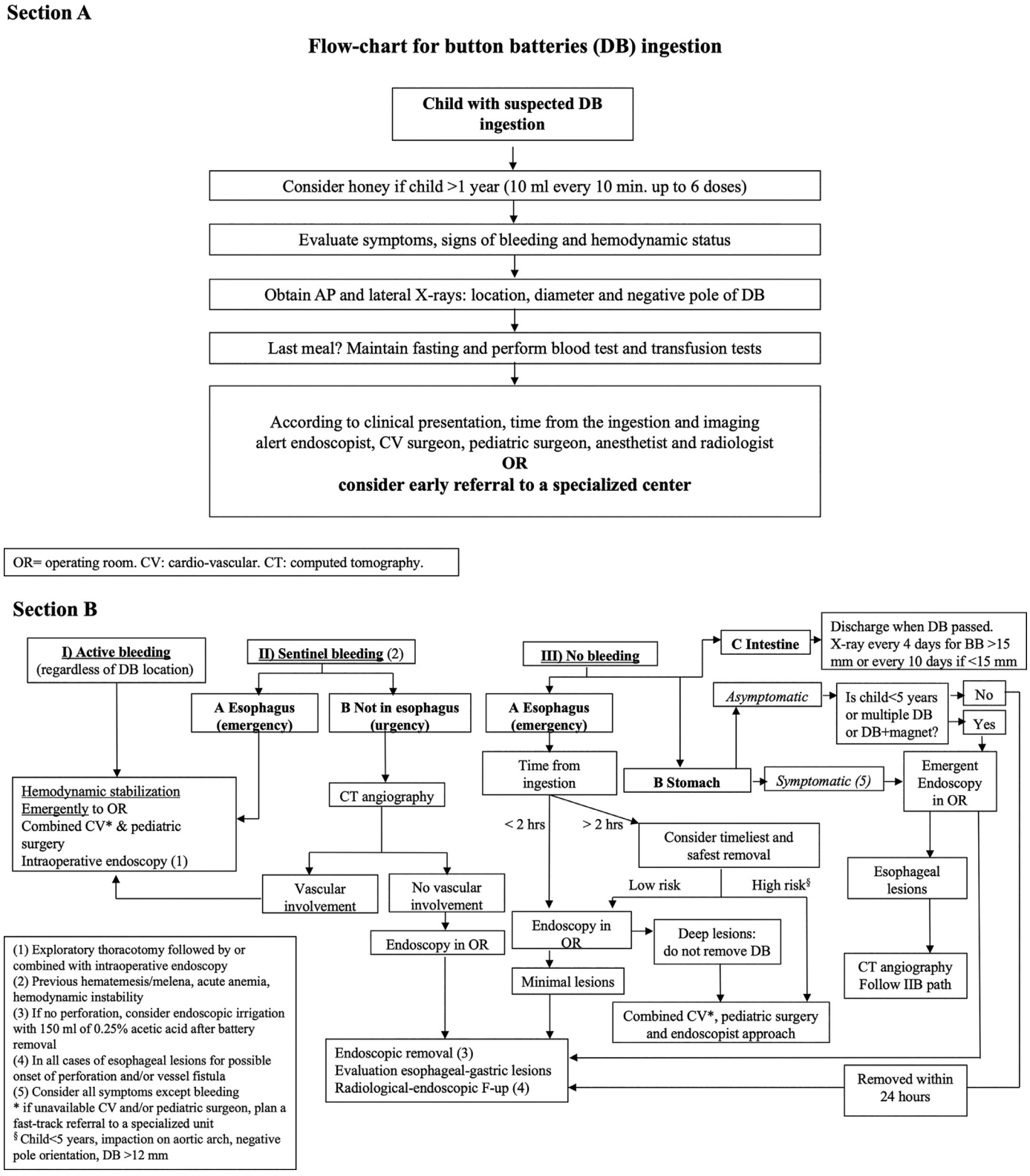

Fig. 2. Management algorithm for disk battery ingestion in children. *Section A*: Preliminary management; *Section B*: Endoscopic timing.

and vascular surgeons' presence in the operating room for stable patients without symptoms 2 h after the ingestion.

A careful literature review has been performed to find more evidence, while international experts from other scientific societies have been consulted about this question. In the end, the panel agreed that there is no evidence as to whether performing an early endoscopy without surgeons' assistance after the 2 recommended hours could be more harmful than transferring patients to another hospital with all facilities but at the cost of taking more time. Surely, having surgeons present and prepared to perform a thoracotomy represents the safest option. However, many small units throughout the country might be unprepared to quickly set up

such a multidisciplinary approach in an emergency fashion. Several factors should be considered according to local availability and expertise to make this choice. Longer or uncertain ingestion time, age <5 years, impaction on the aortic arch, negative pole orientation, battery size >12 mm appear to be associated with higher risks of life-threatening complications and likely suggest a surgery-assisted approach. The final choice should be based upon the approach that can accomplish removal in the timeliest and safest fashion in each unit. As for DB in esophagus causing symptoms, a fast-track referral to a specialized unit should be planned in advance in case of unavailability of one or more required specialists.

If deep ulcerations or bleeding are identified at endoscopy, the battery should not be removed and a combined evaluation with pediatric and vascular surgeons is required even in this case[38,39]. On the contrary, in case of minimal esophageal lesions or non-incarcerated batteries, an immediate removal with assessment of esophageal and gastric burns is appropriate[38,39]. In the absence of perforation signs, an endoscopic irrigation of the injured esophageal area with 150 ml of 0.25% acetic acid after battery removal (to neutralize the battery's alkaline pH) is suggested by National Poison Centers[39,41]. A post-removal follow-up is necessary afterwards.

In symptomatic patients with DB in the stomach, an emergent endoscopic removal with evaluation of esophageal and gastric lesions should be performed. In asymptomatic patients, a removal within 24 hrs seems reasonable, except in cases of concomitant magnets, multiple DB ingestions or children <5 years old in which case an emergency endoscopy is preferable. A CT angiography is suggested to exclude a vascular involvement in case of esophageal lesions[38,39]. The time limit to perform endoscopy in these cases is unknown. However, considering the high risk of serious and evolving lesions, an endoscopy removal from the stomach within 24 hrs appears to be the safest option[38,39].

Endoscopically unreachable DBs in the small intestine necessitate serial X-rays, every 4 and 10 days for battery size of > 15 mm and <15 mm, respectively. Once the battery has been excreted, patients can be discharged. Bleeding symptoms or signs demand a surgical extraction[38,39].

Q7. What is the post-removal management of disk battery ingestions?

Recommendation:

After disk battery removal, an inpatient observation and an endoscopic and radiological follow-up are recommended, since delayed complications may occur even in case of minimal lesions.

[Vote result: Strongly agree: 53%; agree: 35%, neutral: 12%, disagree: 0%, strongly disagree: 0%]

Practice Point:

- *Esophagram, CT scan and MRI are useful tools to detect complications.*
- *A surveillance imaging (esophagram, contrast CT or MRI) should be considered up to several weeks after DB removal.*

Summary of evidence

Despite DB removal, lesions may progress for days to weeks. Acute and delayed complications may include perforations, aorto-esophageal fistula, trachea-esophageal fistula, stenosis, mediastinitis, vocal cord paralysis, pneumothorax and spondylodiscitis[23].

Children should be managed as inpatients and monitored for delayed complications onset. The length of the observation, the fasting time, as well as the frequency of imaging and endoscopic controls should be based on the severity and location of the injuries[23].

Esophagram, contrast CT, CT angiography, MRI and fecal occult blood are useful noninvasive studies for detecting complications[4,23,41,42].

Q8. Which is the best retrieval device for FB removal in children?

Practice Points:

- *A variety of retrieval devices can be used for management of FBs, including rat-tooth and alligator forceps, polypectomy snares, multi-prong graspers, Dormia baskets, Roth retrieval nets, Foley catheters, and variceal ligator caps. The choice depends largely on the type of FB and endoscopist's experience and preference.*
- *Before endoscopy, it is helpful to practice grabbing an object similar to the ingested FB to define the most suitable retrieval devices and the best way to grasp it.*
- *Multi-prong graspers are appropriate for soft objects.*
- *Endoscopic baskets can be useful for rounded objects and retrieval nets or bags can provide a more stable grasp for particular FB (batteries, magnets, coins).*
- *A latex protector hood, placed over and affixed to the tip of the endoscope, could be used as an alternative to an overtube to prevent mucosal damage during the extraction of sharp-pointed objects.*

Q9. What is the management of unrecovered foreign bodies in children?

Practice Points:

An inpatient observation is suggested in children with unclear history or unspecific symptoms, potentially harmful radiopaque FB beyond the duodenum and potentially harmful radiolucent objects not detected by endoscopy. A CT scan might be a useful tool.

Summary of evidence

The majority of ingested FBs pass through the GI tract without complications. In rare cases, ulceration, perforation, bleeding or stenosis may occur.

A CT scan is useful in case of persistent symptoms associated with FB ingestion[43]. In persistent symptoms and/or complications (obstruction, perforation, abscess), surgical removal is necessary if the FB is not endoscopically reachable[7].

3. Food bolus impaction

Q1. What is the initial management of food bolus impactions in children?

3.1 All patients with a suspected food bolus impaction must be evaluated with a detailed medical history for congenital and/or gastro-intestinal diseases, allergies, previous interventions, eating disorders, mental retardation.

[strong recommendation, moderate quality of evidence]

[Vote result: Strongly agree: 60%; agree: 40%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

3.2 We recommend collecting information on: timing, impaction modality and any associated symptoms (number and type of vomiting, chest pain, drooling).

[strong recommendation, moderate quality of evidence]

[Vote result: Strongly agree: 52%; agree: 44%, neutral: 4%, disagree: 0%, strongly disagree: 0%]

3.3 We recommend examining any evidence of luminal obstruction or possible complications (i.e. perforation, mediastinitis, et.) before doing an endoscopy.

[strong recommendation, moderate quality of evidence]

[Vote result: Strongly agree: 72%; agree: 28%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

3.4 We do not recommend inducing vomiting or blindly managing the bolus with a nasogastric tube, especially in symptomatic patients.

[strong recommendation, moderate quality of evidence]

[Vote result: Strongly agree: 72%; agree: 28%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

3.5 We do not recommend performing a radiological evaluation for children with non-bony food bolus impaction without signs of complications.

[low recommendation, moderate quality of evidence]

[Vote result: Strongly agree: 36%; agree: 52%, neutral: 0%, disagree: 12%, strongly disagree: 0%]

Summary of evidence

Differently from adults[44], data on food bolus impaction are scarce in children. In childhood, impactions are generally secondary to underlying esophageal pathology, such as eosinophilic esophagitis (EoE), reflux esophagitis, post-anastomotic stricture, achalasia, and other motility disorders[44–47]. EoE is likely the most common cause[48]. Esophageal perforation is a rare but serious EoE complication, occurring in ~2% of cases. Most episodes are due to food bolus impaction or strictures. Suspected complications should be excluded by X-ray examination before doing endoscopy. Inducing vomiting or a blinded management of the food bolus impactions are not recommended. Use of glucagon to relax the lower esophageal sphincter and promote spontaneous clearance has generally not been recommended[49].

Q2. When should the E.R. doctor contact the on-call endoscopist?

3.6 In case of suspected food bolus impaction, an early evaluation by the endoscopist is recommended.

[strong recommendation, low quality of evidence]

[Vote result: Strongly agree: 52%; agree: 40%, neutral: 8%, disagree: 0%, strongly disagree: 0%]

Q3. What is the endoscopy timing for food bolus impaction in children?

3.7 An emergency endoscopy is recommended in patients unable to manage oral secretions or in case of severe chest pain and odynophagia. Otherwise, endoscopy can be performed within 24 hrs from the onset of symptoms.

[strong recommendation, high quality of evidence]

[Vote result: Strongly agree: 60%; agree: 40%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

Q4. What is the diagnostic work-up of patients after a food bolus impaction episode?

3.8 An appropriate diagnostic work-up for organic or motility disorders is recommended in all patients after a food bolus impaction episode.

[strong recommendation, moderate quality of evidence]

[Vote result: Strongly agree: 60%; agree: 40%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

Summary of evidence

If a spontaneous clearance has not occurred, food bolus must be endoscopically removed (Fig. 3). Patients with severe symptoms or showing signs of near-complete obstruction of the esophagus (eg, drooling, neck pain) require emergency endoscopy to relieve the obstruction, while in children managing secretions endoscopic removal may be delayed up to 24 hrs. This will allow time to coordinate and perform the procedure in a controlled environment, as well as provide additional time for spontaneous clearance.

In the pediatric population as in adults, the technique of removal can include piece-meal extraction (pull technique), suction, and/or gentle pushing of the bolus down into the stomach, although visualization of the distal esophagus is necessary to ensure that there are no distal strictures. Accessories used with the pull technique included Roth nets, polypectomy snares, banding devices, grasping, and alligator forceps[12,50].

We therefore recommend that all children with esophageal food impaction have mucosal biopsies at the time of endoscopic removal with appropriate diagnosis and follow-up of the underlying etiology. When the bolus impaction is caused by a visible lesion, the histological diagnosis may be easily achieved. In absence of a macroscopic lesions, multiple biopsies (at least 6) must be taken to rule out EoE, which presents normal mucosa in almost 15% of cases[51]. A motility study is advisable when other causes have been excluded.

4. Caustic ingestion

Caustic ingestion is a rare but potentially devastating endoscopic emergency. The real incidence is unknown, as the ingestion of corrosive agents is probably largely underreported[52,53]. Caustic agents are chemicals able to induce tissue injury on direct contact ranging from alkaline bases with pH up to 12 to acidic substances with a pH as low as 2. Household, industrial, and farm products represent the most frequently ingested agents in children. Differently from adults, ingestion of caustics in children is usually accidental, with severe injuries being uncommon[11,54–58].

Initial assessment

Q1. What are the first steps in suspected caustic ingestions?

Recommendations:

4.1. We strongly recommend identifying the nature, the physical form (i.e. pH, viscosity), and the quantity of the ingested agent as well as the ingestion pattern (accidental/voluntary/pseudo-voluntary) as first steps in the management of caustic ingestions in children.

[*strong recommendation*, *moderate quality of evidence*]

[*Vote result*: *Strongly agree*: 72%; *agree*: 28%, *neutral*: 0%, *disagree*: 0%, *strongly disagree*: 0%]

4.2. We strongly recommend consulting Poison Control Centers to evaluate the systemic toxicity of the ingested agents and stratify the risk of lesions.

[*strong recommendation*, *moderate quality of evidence*]

[*Vote result*: *Strongly agree*: 68%; *agree*: 28%, *neutral*: 4%, *disagree*: 0%, *strongly disagree*: 0%]

Q2. What are the appropriate maneuvers to be performed in children with a suspect caustic ingestion?

Recommendation

4.3 Maneuvers liable to induce repeat esophageal passage, risks of aspiration of the caustic agents, or attempts to neutralize the pH with other solutions are not recommended.

[*strong recommendation*, *moderate quality of evidence*]

[*Vote result*: *Strongly agree*: 68%; *agree*: 32%, *neutral*: 4%, *disagree*: 0%, *strongly disagree*: 0%]

Summary of evidence:

The extent and the severity of the esophageal damage are directly correlated to the nature and the concentration of the ingested agent, as well as to the duration of the contact and the quantity ingested. Indeed, alkalis produce colliquative necrosis with deep ulcerations and a consequent risk of stricture and/or perforation, while acids usually cause coagulation necrosis with limited tissue penetration [59–61]. Thus, when receiving a child with

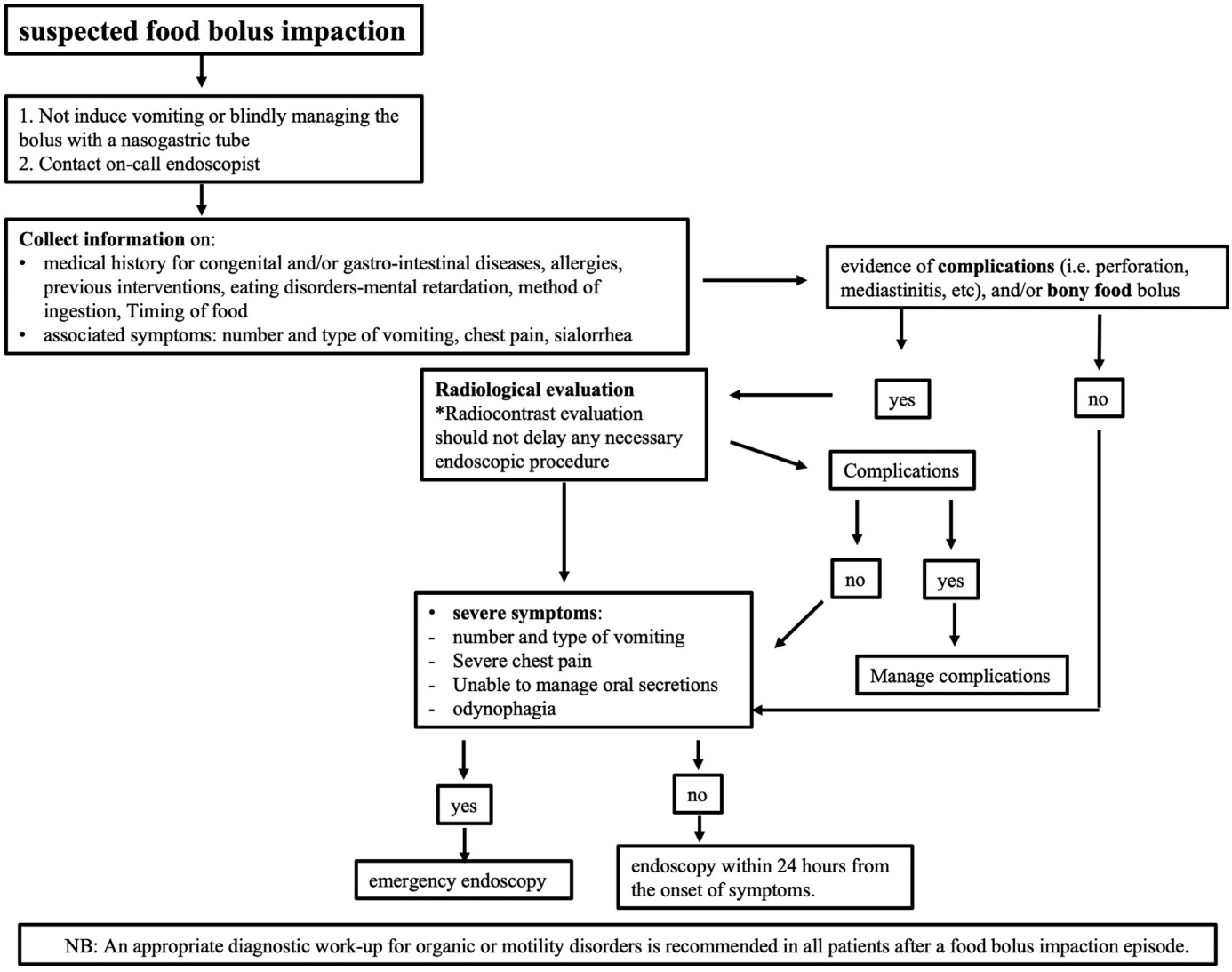

Fig. 3. Management algorithm for food bolus impactions in children.

a suspected caustic ingestion, the first efforts must be to promptly identify the nature, the physical form and the quantity of the ingested agent. To clarify the nature of the substance, contacting a Poison Control Center may be very helpful[53,57,58]. If the ingested product is available, the use of litmus paper in the emergency department may be useful to identify its pH[54]. In addition, the accidental-voluntary ingestion pattern is an essential cornerstone for caustic ingestion management. To this regards, it is important to recall whether the agent was stored in non-original containers, as this may lead to the ingestion of higher volumes of corrosive agent, the so-called "accidental-deliberate" ingestion[54,57]. Once the agent has been identified, performing any maneuver to reduce the exposure or neutralize the substance is discouraged[53,57,58]. Indeed, to induce vomiting may cause a further increase of the injury, Similarly, trying to dilute the corrosive agent can lead to an excessive production of gastric juices, leading to vomit[62,63]. At the same time, an attempt of neutralization of an alkali with an acid and vice versa may result in an exothermic reaction with worsening of the lesions[53,57].

Diagnostic management

Q3. Is endoscopy necessary in patients with suspected caustic ingestion, without signs/symptoms?

Recommendation:

4.4 In asymptomatic children with suspected caustic ingestion, an urgent endoscopy is not recommended. An adequate follow-up must be assured, but the decision should be carefully made case by case.

[*strong recommendation, moderate quality of evidence*]

[*Vote result*: *Strongly agree*: 40%; *agree*: 56%, *neutral*: 0%, *disagree*: 4%, *strongly disagree*: 0%]

Q4. When indicated, which is the most appropriate endoscopy timing following the ingestion?

Recommendation:

4.5 In symptomatic children, or in those with a documented ingestion of corrosive substances (regardless of the presence of symptoms), performing endoscopy within 24 hrs is recommended to properly establish therapies based on the lesions.

[*strong recommendation, high quality of evidence*]

[*Vote result*: *Strongly agree*: 56%; *agree*: 44%, *neutral*: 0%, *disagree*: 4%, *strongly disagree*: 0%]

Q5. Is endoscopy indicated in a patient hemodynamically unstable with a suspected perforation?

Recommendation:

4.6. Endoscopy is not recommended in case of hemodynamically unstable patients, suspected perforations, or severe respiratory distress with compromised upper airway.

[*strong recommendation, low quality of evidence*]

[*Vote result*: *Strongly agree*: 56%; *agree*: 40%, *neutral*: 4%, *disagree*: 4%, *strongly disagree*: 0%]

Q6. Can CT replace endoscopy in damage assessment?

Recommendation:

4.7. Using CT in place of endoscopy in mucosal damage assessment is not recommended.

[strong recommendation, low quality of evidence]

[Vote result: Strongly agree: 44%; agree: 56%, neutral: 0%, disagree: 4%, strongly disagree: 0%]

Summary of evidence

Endoscopy is essential in establishing the severity and the extent of the damage caused by caustic ingestion, thus allowing to plan the most appropriate treatment and follow-up. Whether all children should undergo endoscopy, when to perform it and how to assess the severity of damage are still debated[11,64]. The presence of symptoms such as drooling, oral burns, pain, swallowing difficulties, and bleeding may help guiding the management, being usually more frequent in high-grade injury. However, none of these symptoms is completely predictive of esophageal injury and patients may be even asymptomatic[54,62,65–68]. No biochemical markers can predict injury with certainty, although neutrophilic leukocytosis and metabolic acidosis represent the most reliable signs of severe involvement[69-73]. Each child with a suspected caustic ingestion and the presence of symptoms/signs should receive an urgent endoscopy, while it remains unclear whether asymptomatic patients should or not undergo endoscopy if the ingestion is not certain. Recently, a retrospective study evaluated the safety of a less aggressive protocol in children considered at low risk of ingestion, demonstrating that an oral intake test after 6 hrs followed by discharge might be safe in asymptomatic patients[74].

In agreement with these data and according to the European pediatric guidelines[11], a more conservative attitude with a watchful waiting approach appears the most appropriate in asymptomatic children, thus allowing to evaluate the effective need for endoscopy case by case (Fig. 4). When indicated, endoscopy should take place between 12 and 24 hrs after the ingestion[11,53,64]. The same approach should be recommended irrespective of the corrosive agents' acid or alkaline nature[11,54,75]. Indeed, delaying endoscopy >48 hrs may increase the risk of perforation[75]. On the contrary, in case of unstable conditions, respiratory distress symptoms or if a perforation is suspected, endoscopy has to be postponed[11,54,75].

Although endoscopy is still considered the gold standard for evaluating caustic ingestion injuries, recent adult experiences suggest that CT scan can be considered when endoscopy is not an option, such as in the presence of perforation, supraglottic or epiglottic burn with edema or third degree burns in the hypopharynx[70,76,77]. A combination of both techniques may be used to rule out the need for surgical intervention, especially in case with III b grade lesions[52,78]. Endoscopic ultrasonography (EUS) has recently been suggested due to its ability to evaluate all esophageal layers[79], but its use has not been standardized yet.

Endoscopic procedure

Q7. Is it necessary to perform endoscopy in operating room in patients with caustic ingestion?

Recommendation

4.8 We suggest performing endoscopy for caustic ingestion in the operating room if available.

[*strong recommendation, low quality of evidence*]

[*Vote result*: *Strongly agree*: 28%; *agree*: 64%, *neutral*: 4%, *disagree*: 4%, *strongly disagree*: 0%]

Q8. Should endoscopy be completed in the presence of II or III-degree lesions?

Recommendation

4.9 Unless the esophageal burns are very severe raising concerns about perforation, we suggest passing the endoscope beyond the first burn and into the stomach, to fully evaluate the extent of injury.

[strong recommendation, low quality of evidence]

[Vote result: Strongly agree: 44%; agree: 52%, neutral: 4%, disagree: 0%, strongly disagree: 0%]

Q9. What is the correct endoscopic report for caustic injuries?

Recommendation

4.10 We recommend grading lesions with validated scores and stratify therapy accordingly.

[strong recommendation, high quality of evidence]

[Vote result: Strongly agree: 72%; agree: 28%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

Summary of evidence:

Diagnostic endoscopy should be performed in the operating room[80]. The endoscopic report should include the classification of injuries[53]. Zargar classification is the most widely accepted and not only helps setting up the appropriate medical therapy, but is also predictive of complications such as strictures, mortality, nutritional autonomy, and long-term survival[81–83]. In case of massive ingestions, the esophageal wall may be particularly injured, and diagnostic endoscopy itself may be related to the risk of perforation[53]. Therefore, the use of carbon dioxide insufflation is advisable, to prevent tension-pneumothorax, tension pneumomediastinum, or tension-pneumopericardium[84]. The introduction of the endoscope should always be made by direct visualization of the epiglottis and the endoscopist should report any oral and pharyngeal lesion, which may influence pharyngolaryngeal medium- and long-term complications[85]. To fully evaluate the extent of the damage OGD should be completed, unless a high perforation risk is perceived[53].

Therapeutic management

Q.10 What is the recommended therapeutic management to prevent acute complications?

4.11 To prevent infectious complications and decrease the risk of developing subsequent stricture antibiotic therapy with Ampicillin (50–100 mg/kg/Q.D. x 10 days) is suggested starting from grade 2 lesions.

[weak recommendation, very low quality of evidence]

[Vote result: Strongly agree: 61,8%; agree: 11,8%, neutral: 26,5%, disagree: 0%, strongly disagree: 0%]

Practice Point:

4- *Therapy with Proton Pump Inhibitors (PPI) (0.7–3.5 mg/kg/die x 2–3 weeks) and 72 h semi-liquid diet are suggested to reduce the risk of acute complications.*

Q.11 Is corticosteroid therapy effective in preventing esophageal stenosis in children with severe esophageal lesions after caustic ingestions?

Recommendation

4.12 High doses of intravenous dexamethasone (1 g/1.73m2 per day) for a short period (3 days) are recommended in grade IIb esophagitis.

[moderate recommendation, low quality of evidence]

[Vote result: Strongly agree: 40%; agree: 48%, neutral: 8%, disagree: 4%, strongly disagree: 0%]

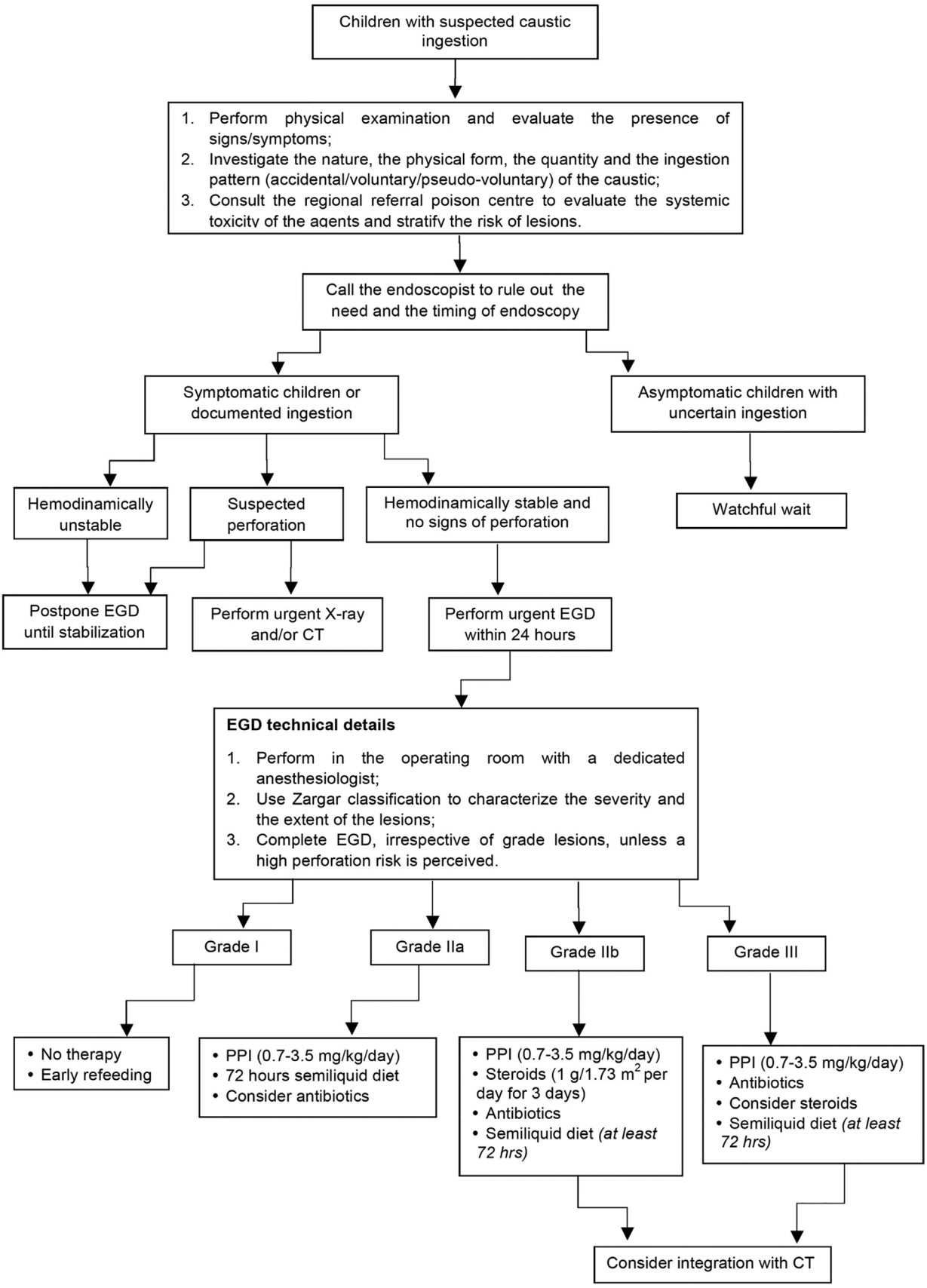

Fig. 4. Management algorithm for caustic ingestions in children.

Practice Point:

4- *Despite there being no evidence of benefit, it is reasonable to consider using intravenous dexamethasone even in grade III esophagitis.*

Summary of evidence:

The therapeutic management for esophageal lesions consequent to caustic ingestion in childhood is variable according to different degrees of esophagitis[86,87] (Fig. 4). For grade 1 esophagitis without deglutition involvement, no therapy is needed, and realimentation is started after endoscopy. In grade 2 and 3 lesions, a therapy with Proton Pump Inhibitors (PPI) (0.7–3.5 mg/kg/die) and a 72 hrs semi-liquid diet appears to be effective in reducing the risk of complications[66,88]. Antibiotics have been shown to markedly reduce the incidence of stricture formation. They are frequently used if a patient has evidence of deep ulcerations, necrosis, signs/symptoms of infection. Ampicillin (dose 50–100 mg/kg/Q.D. x 10 days) is the most used[66,88]. Corticosteroids have been used to prevent stricture formation via reduction of fibroblast proliferation after caustic ingestion in patients with grade 2 or 3 injuries. According to a single pediatric randomized controlled trial, in grade IIb esophageal burns, the stricture development rate was significantly lower in patients treated with high doses of methylprednisolone (1 g/1.73 m^2/day)[89]. Therefore, European pediatric guidelines only recommend high doses of intravenous dexamethasone (1 g/1.73m^2 per day) for 3 days in IIb esophagitis[11]. There is no evidence of benefit from the use of corticosteroids in the other grades of esophagitis. However, it is reasonable to consider using intravenous dexamethasone from grade IIb and above.

Short and long-term complications

Q12. What types of examinations are needed to rule out acute complications after caustic ingestions in children?

Recommendation

4.13 Performing X-Ray or CT to exclude acute complications is recommended after caustic ingestion.

[moderate recommendation, low quality of evidence]

[Vote result: Strongly agree: 40%; agree: 44%, neutral: 12%, disagree: 4%, strongly disagree: 0%]

Q13. What types of examinations are needed to rule out chronic complications after caustic ingestions in children?

Recommendation

4.14 Endoscopy is recommended to diagnose and eventually treat late sequelae after caustic ingestions.

[strong recommendation, low quality of evidence]

[Vote result: Strongly agree: 60%; agree: 40%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

Q15. Is medical treatment effective in treating Gastro-Esophageal Reflux Disease (GERD) in children after caustic ingestion?

Recommendation

4.15 Anti-reflux medications are suggested in case of suspected GERD development. In case of strictures, PPI are recommended as the first line therapy, as soon as the esophageal stricture is diagnosed.

[strong recommendation, low quality of evidence]

[Vote result: Strongly agree: 48%; agree: 52%, neutral: 0%, disagree: 0%, strongly disagree: 0%]

Summary of evidence:

Complications after caustic ingestions can be classified in early or late and in local or systemic. Among early complications, local problems include gastrointestinal bleeding, tracheoesophageal fistula, intestinal perforation, pneumo-mediastinum, pneumoperitoneum, mediastinitis, and peritonitis[90–92]. Systemic early complications may include shock, sepsis, aspiration pneumonia, acute renal failure, hemorrhage, hemolysis, acute hepatic necrosis, disseminated intravascular coagulation and late respiratory failure[90–92]. Diagnosis of acute complication after caustic ingestion is clinical, radiological and endoscopic[11,87,91,92]. To exclude perforation, imaging including X-Ray or CT should be performed[11,53]. Urgent surgery is quite exceptional in the pediatric population.

Among late esophageal complications, stricture is the most frequent, being reported in between 2% and 63% of cases, depending on Zargar grade[66,68,93,94]. endoscopy with dilation remains the main diagnostic and therapeutic tool as first-line treatment[11,53]. Dilation should be avoided from 7 to 21 days after ingestion for perforation risks, thus it is usually done 3 weeks after caustic ingestion to avoid fibrotic exacerbation of stenosis[53,88,91,95]. The disadvantages of endoscopic dilatation include need of repeated procedures, failure to achieve target dilatation, refractory strictures, poor quality of life and cost[11,53]. Using alternatives strategies such as intralesional steroids, mitomycin C and stent placement, positive results have been reported mainly in adults[96–99]. Some patients with severe esophageal lesions develop gastro-esophageal reflux disease (GERD), due to the shortening of the esophagus and motility changes[11,87,92]. GERD occurs particularly in the presence of strictures and it may contribute to persistent dysphagia, despite apparently successful dilatations[92]. PPIs represent the first line therapy in children[11]. Indications to surgery for GERD after caustic ingestion do not differ from those for the general pediatric population[11].

Conflict of Interest

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.dld.2020.07.016.

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