Swallowing disorders, pneumonia and respiratory tract infectious disease in the elderly


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Introduction

Eating and drinking come second in Virginia Henderson’s classification of fundamental human needs. Eating involves gathering people, sharing, anticipating, seeing, smelling, salivating, tasting, and more. It also involves swallowing more than 300 times per hour during a meal. Eating is a necessity for all, a pleasure for many, a sin for some; it is also a danger for others.

The term “swallowing disorders” includes various types of disorders varying in severity; some without clinical consequences, and others that can cause aspiration, lower respiratory tract infections, and malnutrition. The main diseases that cause swallowing disorders show a marked increase in incidence and prevalence with age.

Method

This collaborative study was produced by a multidisciplinary working group formed as a joint initiative of the Société française de gériatrie et gérontologie (French Society of Geriatrics and Geronology) and the Société française de pneumologie (French Society of Pneumology). This group met on 9 and 10 December 2006. Logistical support was provided by GSK laboratories, and scientific secretariat by Concept Santé.

After a literature review, the group concentrated on the writing of this document to inform geriatricians, chest physicians, primary care physicians, and other professionals involved. For this reason, a question and answer structure was chosen. This study was destined to be published in the official reviews of both societies. It has a two-part structure: the first on swallowing disorders in the elderly, and the second on acute, subacute and chronic complications.

Question 1: How does swallowing change with age?

The various structures and functions of the oropharyngeal area do not escape the aging process. The concept of “presbyphagia” in the elderly can be defined as a general slowing of the process of swallowing, affecting both the oral and pharyngeal phases. In the absence of co-morbid conditions, these changes take place slowly and are not very handicapping, even at a very advanced age [1,2].

Changes in the oral phase

Masticatory function is generally preserved in the elderly, but there are dental and neuromuscular changes [3,4] (Table 1).
Table 1  Presbyphagia: alterations in the oral phase.

| Diminished strength of the masticatory and tongue muscles | Difficulties in preparing the bolus (oral preparation time) |
| Diminished anteroposterior tongue movement | Diminished strength of bolus propulsion towards the pharynx |
| Functional deterioration of the dental apparatus | Failure of soft palate elevation to close the posterior oral cavity; leakage of food in the pharynx |
| Diminished saliva secretion | |

The voluntary nature of the oral phase should not be forgotten. This enables conscious patients to compensate for these difficulties by choosing foods with the appropriate texture and increasing chewing time.

Changes in the pharyngeal phase

Aging of the pharyngeal muscles disrupts both the mechanisms of bolus propulsion and upper airway protection, again through various closely linked mechanisms [5,6] (Table 2).

In practice, because of its reflex nature, the pharyngeal phase of swallowing remains the most preoccupying. When swallowing disorders occur at this level, patients cannot establish compensatory mechanisms on their own. The infectious complications that may arise make them apprehensive about eating and can result in malnutrition.

Changes in the oesophageal phase

The most frequently encountered abnormalities of the oesophageal phase in the elderly are: interruption of primary peristalsis, bolus retention in the proximal oesophagus (possibly related to lack of upper oesophageal sphincter compliance), and more frequent tertiary contractions. However, they are asymptomatic or do not show any correlation with the symptoms presented by patients [7—9].

In all, even though the elderly swallow more slowly than young adults, the safety of oropharyngeal swallowing is not compromised simply because of age. Studies have demonstrated that there is no significant increase in the risk of aspiration in the elderly compared with young adults, in the absence of associated disorders. However, the elderly are more likely to develop dysphagia during neurological or upper aerodigestive tract diseases than young adults.

Studies have shown that the cough reflex is not affected by age. Katsumata et al. measured in 110 healthy people aged 20 to 78 years the threshold of inhaled citric acid required to trigger a cough reflex and did not find a decrease in threshold with age [10].

• Thus, all these data suggest that age itself does not significantly increase the risk of aspiration. However, the incidence and prevalence of the main diseases responsible for deterioration in swallowing greatly increase with age.

Question 2: What is the prevalence of swallowing disorders?

A study published in 1990 in the British Medical Journal [11], based on questionnaires completed by 136 subjects aged over 87 on symptoms suggestive of swallowing disorders, found that 16% reported dysphagia. Similarly, Kawashima [12], using a questionnaire administered to 1313 subjects living at home and aged over 65, found dysphagia in 13.8%.

In 2002, Lin published the results of a study associating a questionnaire, a neurological examination, and a swallowing test. Of the 1221 subjects included in the study, with an average age of 77 ± 10 years, 32% of those on a normal diet presented swallowing disorders [13]. Ekberg evaluated 56 subjects with a mean age of 83; the imaging studies showed 63% had problems in the oral phase of swallowing, 25% presented pharyngeal dysfunction, and 36% oesophageal motor dysfunction [14].

Compared with young subjects, the 53 patients with a mean age of 76 studied by Nilsson showed poorer results for the Repetitive Oral Suction Swallow test [15]. Finally, it is interesting to note that, even in patients who are elderly but have retained at least 20 teeth, oral transit time and pharyngeal transit time assessed with a barium swallow were longer compared with young subjects [16].

Table 2  Presbyphagia/Changes in the pharyngeal phase.

| Delayed triggering of the pharyngeal swallowing reflex | Increased length of pharyngeal swallowing time |
| Failure of laryngeal elevation | Food stasis in the epiglottic vallecula and/or pyriform sinuses |
| Diminished strength of pharyngeal contraction | Food dropping into the larynx/aspiration |
| Failure of upper oesophageal sphincter opening | |
The prevalence of dysphagia is estimated at between 8 and 15% in patients living at home, and 30 to 40% in patients living in institutions. One consequence is an increased risk of malnutrition as shown in the study by Suominen [17].

**Question 3: What are the main disorders responsible for swallowing disorders in the elderly?**

Cerebrovascular disease and degenerative neurological diseases are the main causes of dysphagia in the elderly.

**Neurological disorders**

Regardless of age or localization, the incidence of dysphagia “after a stroke” is high but variable depending on the study and the investigations chosen. Incidence is low when based on history taking or a basic physical examination (37 to 45%), higher using a clinical examination or tests conducted by experienced practitioners (51 to 55%), and higher still using instrumental techniques (64 to 68%) [18,19]. Over two thirds of patients hospitalized after a stroke are over 65, making this disorder a major cause of swallowing disorders in the elderly [20]. Even though dysphagia improves in the majority of patients after a stroke, 10 to 30% show persistence of swallowing difficulties. The systematic search for swallowing disorders in acute stroke has a socioeconomic impact. The detection of swallowing disorders and their management can reduce the incidence of pneumonia from 6.7% to 0% in a population of 123 patients 2 years after the introduction of a systematic search for aspiration in acute stroke) [21]. Respiratory complications were responsible for an average extension of stay in acute care units of 7.8 days [22] and an increase in the average burden of care.

“In Parkinson disease”, swallowing disorders fluctuate, but can already be present in the early stages of the disease [23,24]. All the phases of swallowing are involved [23,24]. Feeding difficulties in patients with Parkinson disease are also caused by chewing difficulties, head posture in flexion, motor disorders of the upper limbs, and possible associated cognitive disorders [23,24].

Swallowing disorders are practically constant occurrences “in the progression of dementias”, be they degenerative or vascular, but are underestimated and often ignored [25,26]. All the phases of swallowing are affected, but anomalies of the oral phase are predominant. Strictly speaking, swallowing disorders cause problems less often than eating disorders (absence of swallow or forgetting to swallow, difficulties with fluid intake, archaic sucking reflexes, etc.). The consequences of food provided by third parties are also an issue (inadequate volume, accumulation of food in the mouth, eating too fast, etc.) [27–29]. Sedative treatments can worsen the difficulties.

“Charcot-Marie-Tooth disease”, lacunar stroke, and progressive supranuclear palsy are other neurological causes more rarely encountered.

**Muscular disorders**

Many muscle diseases are likely to result in swallowing disorders due to involvement of the pharyngolaryngeal and cervical oesophageal striated muscles. Their prevalence remains difficult to assess, and is often underestimated when the objective signs are compared with the functional disorders described by patients [32,33].

**Other disorders**

Diabetes [34,35], malnutrition [20], and dehydration are end of life situations often accompanied by swallowing disorders [36].

**Local causes**

Certain local causes can give rise to swallowing disorders: head and neck cancer, Zenker diverticulum, oesophageal achalasia, cervical osteophytes, and oropharyngeal candidiasis [20].

In addition to surgical or radiotherapy treatment, particular attention must be paid to dysphagia caused by the presence of endoluminal devices in the upper aerodigestive tract. A nasogastric tube prevents direct inhalation of food or fluids, but not inhalation of saliva that presents a higher risk of colonization by pathogenic bacteria, because of the absence of oral feeding. It also contributes to incompetence of the upper and lower oesophageal sphincters, and thus the occurrence of reflux and aspiration of gastric contents [20].

**Question 4: Can drugs cause swallowing disorders?**

All drugs likely to induce dryness of the mouth or impaired production of saliva can cause dysphagia [20,37,38]. This is true of all anticholinergic treatments: antihistamines, tricyclic antidepressants, neuroleptics, anti-emetics, agents containing atropine, antidiarheal drugs, antiparkinsonian drugs, and also diuretics. Many inhaled drugs (ENT decongestants, vasoconstrictors, anticholinergics, asthma drugs, corticosteroids, mucolytics or mucous thinning agents) can also cause mouth dryness, cough or oropharyngeal candidiasis.

Moreover, many drugs that alter or depress the central nervous system and the level of alertness can cause dysphagia in the elderly: benzodiazepines, anticonvulsants, antipsychotics, opiates, antihistamines, certain anti-emetics, and lithium [37,38].

Neuroleptics can cause dysphagia through extrapyramidal side effects or orofacial dyskinesia.

Finally, some drugs prescribed for the elderly can cause dysphagia oesophageal in origin, either by decreasing
pressure at the lower esophageal sphincter, resulting in gastro-oesophageal reflux (theophylline, nitrates, calcium channel blockers, benzodiazepines), or by direct damage to oesophageal mucosa, resulting in oesophagitis (non-steroidal anti-inflammatory drugs, prednisone, bisphosphonates, and some minerals such as potassium chloride and iron sulfate) [37,38].

Question 5: Under what circumstances should a swallowing disorder be considered?

Swallowing disorder should be considered in case of:

• “acute aspiration” that is clinically obvious;
• “symptoms immediately suggestive of a swallowing disorder”:
  ○ discomfort/difficulties swallowing,
  ○ food leakage from the mouth,
  ○ nasal reflux,
  ○ food blockage,
  ○ voice changes (gurgly/wet);
• “symptoms often misinterpreted”:
  ○ drooling, food residue in the mouth,
  ○ reduction in food intake as far as complete refusal, especially in a group setting,
  ○ food kept in the mouth for long periods and extended duration of meals,
  ○ throat clearing/hawking,
  ○ weight loss with repercussions on general health,
  ○ recurrent pneumonia,
  ○ unexplained febrile episodes.

When a carer notes difficulties with food intake in an elderly person, this information must be communicated to the prescribing physician.

Nursing aides are often the staff the most present during mealtimes, and should be able to identify and report: immediate or delayed cough (BUT, the absence of cough does not necessarily mean the absence of aspiration!), gurgly or wet voice, and prolonged apnea.

One or more of these symptoms are the first presenting signs that should raise the question of possible swallowing disorders.

Associated symptoms identified by carers that should also suggest swallowing disorders are: recurrent fever spikes distant from meals, hyperthermia of unknown cause, respiratory tract infections, etc.

These warning signs should initiate an assessment protocol in search of a swallowing disorder.

Question 6: What does clinical assessment of swallowing disorders involve?

Clinical assessment of swallowing disorders can be artificially divided into two major stages.

The first stage is thorough history taking with the patient and/or carers; the second stage is examination of the three phases of swallowing: preparatory phase, oral phase and pharyngeal phase.

Clinical tests without food reintroduction tests

These use clinical scales predictive of the risk of aspiration, based solely on the physical examination. The signs used were retained because of their correlation with the presence of aspiration.
of aspiration on the videofluoroscopic examination, the current reference technique in detection of aspiration [39].

Guinvarc’h et al. have proposed a clinical scale predictive of aspiration [40]. It explores six clinical signs: velar and gag reflexes, archaic reflexes, laryngeal blocking, volitional swallow, and voice (dysphonia). Thus, application of the predictive score for aspiration provides a practical approach based on the decision tree proposed (Table 3).

This scale was applied to a validation population of 105 patients. Among these patients, the scale was informative in 69.5% of cases (73/105). Sensitivity was low at 58.3%; specificity was 80.7%.

Food reintroduction tests

Various food reintroduction tests have been proposed. Their interpretation can be qualitative: the principle behind the "3-oz water swallow test" [41], the most often performed. This test requires the drinking without interruption of 90 mL of water. The test is suggestive of aspiration if patients cough in the minute following drinking or if their voice becomes gurgling, wet or hoarse. Study of its correspondence with videofluoroscopy attributed a sensitivity of 76% to the "3-oz test". This rose to 94% if only the aspiration of over 10% of the volume of fluid ingested on videofluoroscopy was counted, and 94% for aspiration of solids on videofluoroscopy. Apparently only four of the 44 patients tested by DePippo presented aspiration with abolition of the cough reflex, which for the author justified the use of food reintroduction tests alone [41]. Specificity was 59%. Gottlieb [42] validated the use of a reduced volume of 50 mL.

The "water test", adapted by Mr Guatterie in Bordeaux, consists in the successive drinking of four spoons (2 mL) of still water, with an increase in the volume each time (4 mL, 8 mL, 50 mL), if there is no aspiration, up to drinking of a glass of water. This can be performed by a previously trained nurse [43–46].

The "Timed test of swallowing capacity" [47] is a quantitative test to explore swallowing. It involves measuring the time of ingestion of 150 mL of cold water (from contact with the lips to the last laryngeal elevation). If total intake is not possible, onset of a cough or a change in voice is taken into account. Temperature, flavour, and repetition of the test do not affect the rate of ingestion. The pathological threshold for speed is 10 mL/s (this result is valid only for subjects aged under 70 years). However, these results have not been confronted with videofluoroscopic studies of aspiration.

Mixed tests

The association of suspicious signs and/or symptoms and food reintroduction tests is an interesting strategy used in the "Burke Dysphagia Screening Test" [48]. This test is positive, indicating aspiration, if one or more of the following criteria are verified: (1) bilateral stroke, (2) brainstem stroke, (3) acute pneumonia, (4) positive "3-oz Water Swallow Test", (5) eating less than half of a meal (for three consecutive meals), (6) prolonged food intake (greater than 30 minutes), (7) non-oral feeding. This test identifies 92% of patients with complications secondary to aspiration: pneumonia, aspiration syndrome or death (11 of the 12 patients with complications of the 139 patients with stroke in DePippo’s article [48]). Daniels [49] proposed a similar approach and explored six clinical indicators: dysphonia, dysarthria, velar and gag reflex abnormalities, weak voluntary cough or cough impossible after food intake (tests using 5, 10 and 20 mL) and voice modifications after a swallowing test. Sensitivity was 92.3%, and specificity 66.7% (Table 3).

Swallowing tests are a simple method of systematic detection among populations at risk of aspiration that enable rapid implementation of appropriate therapeutic measures (postural and dietary modifications). Mixed tests are the most interesting, associating sufficient sensitivity (58.3 to 94%) and specificity (59 to 80.7%) for a diagnostic test.

Question 7: What can further investigations contribute?

Further investigations are particularly indicated when the clinical assessment is not contributive. They will confirm or rule out the disorder, specify the mechanism and validate adaptations for alleviation.

The following explorations can be considered: videofluoroscopy, endoscopy, and pharyngoesophageal manometry [50–52].

Videofluoroscopy

This is mainly interesting for the dynamic examination in real time of the act of swallowing: "live" observation of the
different phases of swallowing: oral (volitional), pharyngeal and oesophageal (reflexes).

This investigation can explore the three aspects:
• mobility of the structures involved, approach to the physiology of the patient during food intake;
• mouth muscle tone (chewing), velopharyngeal sphincter, pharyngeal peristalsis enabling opening of the upper oesophageal sphincter, etc.;
• hypopharyngeal sensitivity activating the cough reflex, beneficial in the case of aspiration.

Analysis of the results, in addition to clinical observations, help in the choice of the most appropriate treatment for the patient.

Examination conditions
The examination is rapid and non-invasive; the patient does not need to be fasting. Two prerequisites must be met: patient alertness, and standing or sitting being possible. Suction equipment should be on hand. The examination is performed in the fluoroscopy lab, with video recording, transferred to DVD, for detailed review later.

Protocol
We advise ingestion of:
• three mouthfuls of Micropaque HD® alone;
• three mouthfuls of diluted product;
• three mouthfuls of an opacified solid.

The textures ingested are, of course, adjusted according to previous clinical observations. The choice of the number of mouthfuls to identify a difficulty with initiating swallowing (frontal disorder) or, conversely, increasing difficulty with aspiration at the last mouthful (early ALS). The examination is interrupted in the case of massive aspiration of the product (over 50%).

The examination is first performed in lateral projection, to make the following observations:
• documentation of aspiration, observation and localization of stasis (valleculae, pyriform sinuses);
• mobility and muscle tone of the tongue and tongue base;
• epiglottic tilt;
• laryngeal elevation (N = 1.5 vertebrae), with anterior tilt, and simultaneous advancement of the hyoid bone (N = 50% of jaw length);
• opening of the upper oesophageal sphincter.

The examination is then performed in anterior projection, for identification of pharyngolaryngeal asymmetry, particularly during emptying of the valleculae and pyriform sinuses (unilateral laryngeal paralysis).

The DVD recording enables detailed analysis later.

The examination can:
• confirm whether or not further examinations are required (for example, no need for manometry or endoscopy if a disorder of the voluntary phase is involved);
• enable treatment choices:
  • rehabilitation if the disorder involves the voluntary phase,
  • adjustment of food textures,
  • possible surgical procedures: gastrostomy if the disorder involves the reflex phases, myotomy, botulinum toxin (limit of the upper oesophageal sphincter).

Restrictions and contraindications
The restrictions concern the patient’s condition: alertness, and also ability to remain standing or sitting for around 15 minutes. Moreover, the patient must understand and follow the instructions given, and not present any major cognitive or psychiatric disorders.

The contraindications are lower respiratory tract infection and previous certainty of massive aspiration.

Endoscopic examination of swallowing
Performed by an ENT specialist, using a flexible endoscope and a light source, it provides direct vision of the velopharyngeal sphincter, hypopharynx and glottal closure.

This invasive examination requires the cooperation of a relaxed patient; it can be considered when videofluoroscopy cannot be performed, due to inability of the patient to remain standing or sitting, or when there is a major risk of aspiration.

This examination does not assess the oral voluntary phase and only provides a partial view because of loss of lighting during epiglottic tilt and glottic closure.

Pharyngo-oesophageal manometry
It records changes in pressure in the pharynx during passage of the bolus, with a nasal tube, and sensors placed at different levels of the pharynx.

It measures the effectiveness of pharyngeal peristalsis and upper oesophageal sphincter tone in the phases of relaxation (opening of the upper oesophageal sphincter) and contraction (closure of the upper oesophageal sphincter).

This examination is also invasive, and is justified when videofluoroscopy shows impaired opening of the upper oesophageal sphincter (possible cricopharyngeal relaxation disorder).

It does not identify pharyngeal abnormalities and does not provide precise indications concerning the origin of aspiration.

Question 8: What are the main mechanisms of aspiration [43]?

Aspiration before swallowing
"Due to absence of the swallowing reflex". In this case, no posture changes to facilitate swallowing or texture changes can activate this reflex.

Possible causes: surgery involving the epiglottis and extending widely to the base of the tongue, post-radiotherapy sensory lesions to the base of the
Swallowing disorders, pneumonia and respiratory tract infectious disease in the elderly

Paralysis.

Psychological and emotional investment of the elderly personal meal.

Provide significant assistance, particularly concerning the team.

Participation of the various members of the paramedical (everyday life), but the French decrees authorize paralysis.

Transforms rehabilitation into an environmental situation of adaptation or rehabilitation. The speech therapist occupational therapists, psychomotricians) with the objectives of swallowing; the nurses and nursing aides are the intermediaries between the patient and the nursing team.

They must teach the nursing staff the functional aspects of swallowing: the nurses and nursing aides are the staff the most often present on a daily basis; quality care is only possible with the complementary skills of these different carers.

Palliative strategies.

Faced with a progressive disease, in particular neurological, for which no specific therapy is available, adaptation of food textures is done regularly depending on the worsening of any distractions or disruptions that could result in aspiration;

Using appropriate equipment, depending on the possible motor difficulties of the patient. The assessment by the occupational therapist will enable introduction of appropriate technical aids (cutlery with large handles, plates with rims, glasses with a cut out section for the nose, non-skid table mats, etc.) and rehabilitation of fine movements.

Observation of how the objects required for eating are placed is necessary to facilitate meal taking. Sometimes just placing a fork too far away on the table can tire the patient who will eat less and less.

Reintroduction of food intake.

Reintroduction of food intake is accomplishing again, and with success, the functions of chewing and swallowing, without aspiration.

The decision to resume food intake or adapt food texture requires a medical prescription based on the results of the swallowing assessment, and in consultation with the nursing and rehabilitation teams.

There are four successive stages: stage 1, "smooth" texture; step 2, "semi-liquid" texture; step 3, "soft/minced" texture; step 4, "normal" texture. The four steps are detailed in Tables 4—7.

The transition from one stage to another is decided according to well-codified criteria. At each stage, a nasopharyngeal suction system in working order must be installed in the patient’s room, in case massive aspiration occurs.

Rehabilitation.

The role of the physiotherapist or speech therapist present in the structure is that of patient rehabilitation, information and education, with their own tools; they also act as intermediaries between the patient and the nursing team, by providing practical information in a real-life situation.

The therapist must teach the nursing staff the functional aspects of swallowing; the nurses and nursing aides are the staff the most often present on a daily basis; quality care is only possible with the complementary skills of these different carers.

Question 9: How are swallowing disorders managed?

Management must have as its priority: maintaining the pleasure in eating and drinking, while guaranteeing a vital necessity [53—57].

Teamwork.

This is necessarily a coordinated effort involving all actors in the health system: health care professionals including physicians, nurses, nursing aides, dietitians, rehabilitation staff (physiotherapists, speech therapists, occupational therapists, psychomotricians) with the objective of adaptation or rehabilitation. The speech therapist transforms rehabilitation into an environmental situation (everyday life), but the French decrees authorize participation of the various members of the paramedical team.

It is also essential to involve family members, who can provide significant assistance, particularly concerning the psychological and emotional investment of the elderly person in meals.

The installation of a patient who has swallowing disorders.

The nursing staff plays a vital role from the time of meal preparation. The risk of aspiration can be reduced by:

- positioning the patient, sitting well upright, or half-sitting if necessary but with the head properly held up, possibly in anterior flexion to protect the upper airways and facilitate opening of the upper oesophageal sphincter;
- arranging of the patient’s environment, with elimination of any distractions or disruptions that could result in aspiration;
- using appropriate equipment, depending on the possible motor difficulties of the patient. The assessment by the occupational therapist will enable introduction of appropriate technical aids (cutlery with large handles, plates with rims, glasses with a cut out section for the nose, non-skid table mats, etc.) and rehabilitation of fine movements.

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Table 4  “Smooth” texture stage.

<table>
<thead>
<tr>
<th>STAGE 1: “Smooth” texture</th>
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<tbody>
<tr>
<td>Jelly (water + gelatine)</td>
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<tr>
<td>High-protein creams</td>
</tr>
<tr>
<td>Fromage blanc</td>
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<tr>
<td>Stewed fruit</td>
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</table>

This smooth texture with pieces or residue helps the food to slide easily to the stomach. Disobstruction is easier with the suction device. Remaining attentive to the reactions of the patient is essential. Note:

- Patient behaviour (sweats, cyanosis, pleasure/displeasure, tension/relaxation, etc.)
- Observation of the protocol
- Whether swallowing was easy or not
- Coughing during or after oral feeding
- Respiration function in the hours following the meal

Be careful of silent aspiration; coughing during a meal indicates aspiration; but, conversely, absence of coughing does not necessarily mean the bolus was swallowed correctly. Any doubts concerning silent aspiration require pulmonary auscultation.

The test may also trigger anxiety attacks because of memories of a previous episode of aspiration. The explanations and technical advice should be repeated and rephrased as often as necessary. If anxiety remains unmanageable with a risk of failure of food reintroduction, psychological support could be proposed.

The following questions should be asked concerning the patient:

- Did this test seem to be pleasant for the patient?
- Was the food bolus swallowed easily?
- Did the patient participate in the rehabilitation process?
- Was the patient stimulated by the reintroduction of food?
- Was the patient relaxed?

If progression of the bolus is satisfactory, and does not trigger the cough reflex, a feeling of discomfort or choking, other tests may be performed, still with smooth textures, until the technique of swallowing is perfectly mastered.

The next step will depend on the results of this learning process and the complete absence of aspiration.

Question 10: What are the acute and chronic complications of swallowing disorders?

Acute manifestations

There are three major clinical pictures:

- "an obvious picture of tracheobronchial aspiration of a foreign body", usually food. The symptoms are typical. They depend however on the volume of aspiration, going from classical penetration syndrome, well described by the patient or a witness, associated with attacks of suffocation, cough, dyspnoea, and desaturation, to a rarer and rapidly fatal picture of asphyxia, paradoxically underdiagnosed in acute situations. An autopsy study conducted in Vienna between 1984 and 2001 on 200 cases of asphyxia by aspiration of foreign bodies showed that although the episode occurred in 68% of cases in the presence of a witness, before death, the correct diagnosis had only been suggested in 5% of cases in patients over 65 (105/200). This study identified risk factors for massive food aspiration, namely an underlying neurological disease (Parkinson disease, Alzheimer disease, and stroke), taking sedatives (all the elderly patients who died in the morning had been given a sedative treatment the evening before), a semi-solid diet (mashed vegetables, minced meat, fruit jam), and poor dental status (35% of those over 65 were edentulous) [58];
- "a picture of gastric content aspiration producing classic Mendelson syndrome" (aspiration pneumonitis). This is defined as chemical pneumonitis, secondary to the aspiration of regurgitated sterile acid gastric fluid that, at least initially, is not infectious. However, it has been shown that gastric fluid can be colonized by *Staphylococcus*
Table 5  **“Semi-liquid”** texture stage.

<table>
<thead>
<tr>
<th>Stage 2: “Semi-liquid” texture</th>
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</thead>
<tbody>
<tr>
<td>A semi-liquid texture enables the introduction of more granular textures. It also enables assessment of meal duration and patient fatiguable as the composition is the same as a normal meal</td>
</tr>
<tr>
<td>Minced meat</td>
</tr>
<tr>
<td>Puréed/mashed vegetables</td>
</tr>
<tr>
<td>Desserts (stewed fruit, yoghurt, fromage blanc, etc.)</td>
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</table>

These meals are only taken at lunchtime as they are part of the rehabilitation process. The speech therapist responsible for reintroduction of oral nourishment must do so in the presence of the nursing staff. This is an indispensable part of their training. The speech therapist notes his/her interventions on the specific report card in the medical record, indicating it is a rehabilitation session. At all the stages of this rehabilitation process, the nursing and rehabilitation teams write up their interventions on a common report card. The dietitian contributes by determining the preferences of the patient, and the possibilities for daily meals. The dietitian can also limit the choices of foods depending on the indications provided by the speech therapist or physiotherapist: referred to as a personalized diet.

The physician informs the team about the absence of any intercurrent medical conditions.

Liquids are reintroduced gradually observing the following successive stages:
- Coca Cola® type sodas strong in taste and that trigger considerable sensory impulses
- Cool sparkling water
- Cool flavoured still water
- Cool unflavoured still water
- Unflavoured still water at room temperature

If the reintroduction of oral liquids is impossible, hydration will be through an enteral feeding tube, or with jelly (water + gelatine) that has the advantage of being smooth, melting in the mouth, and having pleasant flavours. Approximately 15 pots of jelly are required to provide satisfactory hydration (a pot of jelly corresponds to a 100 mL glass).

Progress to the next stage is decided on the same criteria as for the “smooth” texture stage:
- No discomfort after oral nourishment
- No cough
- No bronchial obstruction during and after eating
- A pleasurable experience
- Observance of the protocol
- Absence of anxiety

If the patient has the motor capacity to feed him/herself, this will be one of the aims of rehabilitation. The pleasure of being able to bring food to the mouth oneself is part of patient autonomy. A feeling of frustration can emerge when this is not possible because of an associated physical handicap. Awaiting full recovery of autonomy at meals, the assistance provided by the nursing team should pay attention to the patient’s pace of progress, and be both stimulating and supportive, to supply sufficient food intake.

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*aureus* or enterobacteria as pH is increased by antacid treatments and with enteral feeding [59]. The occurrence of chemical pneumonitis usually implies the presence of consciousness disorders (epilepsy, stroke). Acidity plays a key role. Experimental studies in animals have shown that pH must be below 2.5 and volume greater than 0.3 mL/kg for lung lesions to develop (chemical burn of the bronchial tree and inflammatory reaction of lung parenchyma). Diagnosis is not a problem when aspiration takes place in the presence of a witness. The picture can very quickly become dramatic and associates polyphoena, cough, cyanosis, pulmonary oedema, hypotension and hypoxaemia with rapid progression to respiratory distress syndrome (ARDS); Mendelson syndrome represents approximately 10% of the causes of ARDS [60]. According to Mylotte [61,62], chemical pneumonitis is more common than aspiration pneumonia, which should have an impact on treatment management, particularly by limiting the use of antibiotics, as with a non-infectious process the symptoms can rapidly improve with symptomatic treatment;

- **“a picture of lower respiratory tract infection, often recurrent”,** involving one or more events suggestive of lower respiratory tract infection, including cough, pleural type pain, fever over 38.5 °C, purulent sputum, respiratory rate equal to or over 25 per minute, signs of localization on the physical examination (crackles or bronchial rales) and radiological appearance consistent with the picture. Even though these acute symptoms may seem unremarkable, this is the most frequent clinical presentation and the most difficult to understand, firstly because the symptoms of lower respiratory tract infection can be atypical in the elderly, sometimes raising difficult problems with differential diagnoses such as pulmonary embolism. These diagnostic difficulties are increased by interrelationships with the patient’s constitution, whether a question of chronic obstructive pulmonary disease or heart failure.
Table 6 “Soft/minced” texture stage.

<table>
<thead>
<tr>
<th>STAGE 3: “Soft/minced” texture</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Starter:</strong> ‘protein supplements’ such as sardines, eggs, sausage, cheese pancakes, tomatoes, etc.</td>
</tr>
<tr>
<td>Minced meat</td>
</tr>
<tr>
<td>Whole vegetables and/or starchy foods</td>
</tr>
<tr>
<td>Dairy products and/or cheese</td>
</tr>
<tr>
<td>Cooked and/or stewed fruit</td>
</tr>
<tr>
<td><strong>Minced meat</strong></td>
</tr>
<tr>
<td>Whole vegetables and/or starchy foods</td>
</tr>
<tr>
<td>Dairy products and/or cheese</td>
</tr>
<tr>
<td>Cooked and/or stewed fruit</td>
</tr>
<tr>
<td><strong>This type of diet requires great care. It contains foods that are often a risk for a patient still fragile concerning swallowing</strong></td>
</tr>
<tr>
<td>The foods presenting risks are</td>
</tr>
<tr>
<td>Raw vegetables</td>
</tr>
<tr>
<td>Raw fruit</td>
</tr>
<tr>
<td>Rice, semolina, etc.</td>
</tr>
<tr>
<td>Raw vegetables such as grated carrots and corn, or raw fruit, must be chewed. In a patient lacking effective mastication, due to paralysis for example, or when the food is not satisfactorily mixed with saliva (this is necessary for propulsion of the food bolus), these foods are likely to “stick” and remain “blocked” in the pharyngolaryngeal junction. When the airways open, the bolus penetrates into the trachea and causes aspiration</td>
</tr>
<tr>
<td>Pulses and cereals, such as rice, semolina, peas, lentils, and small kidney beans, are often poorly mixed with saliva. They remain on the walls of the mouth and escape at an inopportune moment into the trachea. Care should also be taken with French beans as they can be stringy. They get stuck between the tonsillar pillars, and trigger nausea that can cause aspiration</td>
</tr>
<tr>
<td>The dietitian can have the kitchen prepare supplements such as lasagna, soufflés, and shepherd’s pie. These supplements have the advantage of being high in protein, and have a “soft pieces” texture like pasta that get the patient used to chewing again without being too tiring</td>
</tr>
<tr>
<td><strong>Progress to the next stage follows the same criteria as for stages 1 and 2</strong></td>
</tr>
<tr>
<td>The following two parameters must also be considered</td>
</tr>
<tr>
<td>Meal times</td>
</tr>
<tr>
<td>The ability to chew hard food, or poor dentition that can result in the exclusion of a food presenting a risk</td>
</tr>
</tbody>
</table>

Secondly, because once these differential diagnoses have been ruled out, there is no certainty that the clinical picture can be attributed to a swallowing disorder. Finally, because once a swallowing disorder has been recognized, it may not be responsible for infections.

Subacute or chronic manifestations

These are more difficult to understand because clinical signs associating dyspnoea and cough with expectoration can be present in frequent and unremarkable chronic respiratory disorders such as chronic obstructive pulmonary disease and asthma; possible underlying heart failure can add to the confusion. The clinical picture can also be that of recurrent pneumonia, recurrent unexplained fever, non-specific unilateral or bilateral radiographic abnormalities, and so on. Chronic occult aspiration can thus cause specific disorders, quite rarely described but often underestimated considering the context of onset. For example:

- paraffinomas secondary to repeated aspiration of liquid paraffin in chronic constipation with possible concomitant *Mycobacterium fortuitum* infection;
- obliteratoring bronchiolitis with organizing pneumonia (BOOP) [63], particularly if there are varying radiographic abnormalities;
- diffuse aspiration bronchiolitis, a relatively rare entity described by Matsuse [64], occurring in elderly patients with an unremarkable clinical picture of dyspnoea with cough, and bilateral micronodular infiltrates. This disorder is characterized by the presence of foreign particles and bronchiolar inflammatory infiltrates. It occurs in bedridden patients with a history of neurological disorders or dementia presenting swallowing disorders, whether identified or not.

**Question 11:** Can a clinical distinction be made between chemical pneumonitis (inflammation related to aspiration of gastric fluid) and aspiration pneumonia (infection)? Is this distinction useful?

The importance of distinguishing the two entities is theoretically twofold: on the one hand, the prognosis is not the same, it is better in chemical pneumonitis that often regresses with symptomatic treatment; on the other hand, with aspiration of gastric fluid not causing infection, at least initially, there is no need to treat chemical pneumonitis with antibiotics immediately.

However, the distinction is not easy to establish because in both cases there are signs suggestive of lower respiratory tract infection. Mylotte et al. studied this issue [61]. They propose some preliminary definitions:
Table 7  “Normal” texture stage.

<table>
<thead>
<tr>
<th>STAGE 4: Texture: “normal”</th>
</tr>
</thead>
<tbody>
<tr>
<td>All types of starters</td>
</tr>
<tr>
<td>Meat</td>
</tr>
<tr>
<td>Vegetables</td>
</tr>
<tr>
<td>Cheese/dairy products</td>
</tr>
<tr>
<td>Fruit</td>
</tr>
<tr>
<td>Bread</td>
</tr>
</tbody>
</table>

More time must be taken when progressing with meat texture as this is the most dangerous food. A piece of steak is not only difficult to chew but also to pass into the esophagus. There are alternatives for meats more difficult to chew, such as omelette, fish, minced steak.

Some patients will never progress to this texture, or only late in the process, but this should not interfere in any way with the decision to remove an enteral feeding tube as energy requirements can be covered by the “soft/minced” diet. This last stage includes “resocialization”, and concentration on the meal, with the objective of autonomy. If allowed by the structure of the institution, the patient should be taken to the dining room to observe whether distractions cause aspiration. Some patients may, in addition to mechanical difficulties, present learning disabilities, and attention or concentration difficulties during meals. These can result in far greater risks than those associated with mechanical problems. These disorders must thus be considered and an appropriate solution found for each patient and each structure.

- Reassessment of possibilities for the patient to integrate the protocol
- Training of nursing staff in higher function disorders
- Setting up a surveillance system for observation of meals

Criteria for effective swallowing are at this stage:
- Ease of swallowing
- Absence of cough
- Absence of pneumonia
- More or less normal duration of meal time (approximately 1/2 hour)
- Absence of anxiety
- Pleasure

And also criteria such as:
- Nutritional status in conformity with the dietary goals set (energy needs covered by the reintroduction of oral nourishment)
- In the end: ingesta (all the food and liquid intake by an individual in one day) sufficient to reduce and then stop gastrostomy feeding

- “Definite” aspiration is defined as an episode of suffocation in the context of vomiting or during feeding in the presence of a witness;
- “Probable aspiration” (without a witness) is defined as the appearance of at least one of the following within 24 hours after an episode (with a witness) of vomiting, cough during feeding, displacement of a gastric tube, or the presence of vomit on clothes or the pillow: new infiltrate on the chest radiograph, tachypnoea (over 18/min), fever or change in behavior without an obvious cause;
- “Suspected aspiration” is defined as the absence of criteria of certainty of aspiration and by the sudden onset of symptoms of lower airway disease, i.e. polypnoea, hypoxaemia and fever, in a previously stable patient with at least one of the following criteria: presence of a nasogastric tube, swallowing disorders or lower lobe infiltrate;
- “Pneumonia” is defined as the absence of a clinical picture of aspiration (definite or suspected), a radiological appearance compatible with one or more of the manifestations suggestive of lower airways infection: cough, pleural pain type, fever over 38 °C, purulent expectoration, respiratory rate above or equal to 25/min, localizing signs on the physical examination (crackles or bronchial rales);
- “Aspiration pneumonia” is defined as symptoms of lower respiratory tract infection associated with an episode of confirmed or suspected aspiration and radiological signs of lower lobe infiltrates (unilateral or bilateral). This corresponds to what we have called chemical pneumonitis secondary to aspiration of gastric fluid.

In the study by Mylotte et al., 330 institutionalized patients admitted with suspected pneumonia were analyzed retrospectively. One hundred and ninety five patients were classified in three categories: chemical pneumonitis (86 cases), aspiration pneumonia (43 cases), and episode of “simple” aspiration (66 cases).

The main conclusions of the study were the following:
• according to the study definitions, chemical pneumonitis was twice as frequent as aspiration pneumonia in institutionalized elderly patients admitted to hospital with a diagnosis of pneumonia;
• there was no difference in terms of age, co-morbidity or laboratory parameters between the three groups except for swallowing disorders and the presence of a nasogastric tube being more frequent in the chemical pneumonitis group;
• there was no difference in the proportion of antibiotic prescription (73%). Prescriptions were for 5.3 ± 2.4 days for pneumonia, 4.8 ± 2.7 days for chemical pneumonitis, and 3.8 ± 2.4 days for episodes of aspiration. Significantly more patients presenting chemical pneumonitis or an episode of aspiration were administered antibiotics for less than 24 hours (11 and 23% against 0% for pneumonia);
• there was no difference in mortality or hospital stay between the groups.

Following this study, based on the knowledge of aspiration of gastric fluid and appearance on the chest radiographs, characterizing four clinical situations ("chemical" pneumonitis, pneumonia due to aspiration, simple episode of aspiration, and bronchitis), an algorithm was developed (Fig. 1) whose main objective is to guide treatment management. It recommends that aspiration pneumonia should not be treated with antibiotics if the symptoms have lasted less than 24 hours. Patients whose symptoms exceed 24 hours have a risk of bacterial infection and should be treated. Symptomatic patients without radiographic images do not require antibiotic therapy. This algorithm was used prospectively in another study which confirmed the relevance of these recommendations [62].

Question 12: What is the epidemiology of aspiration pneumonia?

Epidemiological studies have shown that, firstly, the incidence of pneumonia increases with age, with a risk six times greater among those over 75 than among those under 60 [65,66] and, secondly, that the incidence is greater in institutional than in community environments. Surveys conducted very regularly in the United States since 1980 have also shown an increase with time of the incidence of lower respiratory infections that are responsible for more than 45% of days of hospitalization, and an identical proportion of deaths from infectious diseases [67]. An editorial in The Lancet Infectious Diseases in January 2006 stressed the urgency of finding ways to reduce the risk of infection in this age group. Several recent publications argue that we must differentiate community-acquired pneumonias from pneumonias occurring in patients living in institutions or receiving home care. In the article by Kollef in Chest in 2005 [68], patients in institutions who presented pneumonia were older, had been hospitalized longer, and showed different bacterial epidemiology with less pneumococci and more staphylococci and Pseudomonas aeruginosa.

Concerning aspiration pneumonia, because there are no consensual diagnostic criteria, interpretation of literature data is difficult. In most studies, the diagnosis is based on the presence of lower respiratory tract infection in a patient with a risk of aspiration or occurring after aspiration [69].
For aspiration pneumonia to develop there must have been aspiration into the larynx and lower respiratory tract of oropharyngeal contents previously colonized by pathogens.

Even though the etiology of aspiration pneumonia is multifactorial [70] and the relationship between dysphagia and pneumonia is not direct [71], there is a strong association between swallowing disorders and the development of aspiration pneumonia [72].

Loeb et al. studied the risk factors for onset of pneumonia in residents of long-term care facilities in the United States [70]. In this study, multivariate analysis revealed that difficulty in swallowing food and medications were the most important risk factors. Similarly, a French study has identified as risk factors for nosocomial pneumonia in a geriatric hospital: malnutrition, heart failure, prescription of antibiotics in the previous month, dependence for feeding and the presence of a gastrostomy [73].

Several publications have also highlighted the important role of poor oral hygiene and reduced salivary flow [74,75] that facilitate colonization of the oropharynx. Many drugs such as diuretics, antihistamines, anticholinergics, and neuroleptics decrease saliva flow and thus could increase the risk for aspiration pneumonia. Moreover, randomized studies have shown that good quality oral care decreased the number of cases of pneumonia in institutionalized populations.

In a systematic review, the authors identified 17 randomized trials of interventions to prevent aspiration pneumonia in the elderly [76]. They concluded, however, that there was insufficient proof of effectiveness of the different strategies proposed: patient positioning, dietary changes, oral hygiene, gastrostomy education for caregivers, or drugs. New interventional studies on prevention are required. However, other reports suggest that angiotensin converting enzyme inhibitors may have a preventive effect because they increase levels of substance P, a neurotransmitter that plays a key role in cough [77,78].

**Question 13: What antibiotic treatment for aspiration pneumonia?**

The French guidelines for the management of pneumonia in 2001 differentiate aspiration pneumonia and recommend their first-line treatment with amoxicillin associated with clavulanic acid (AAC) [79]. The 2003 IDSA recommendations also mentioned this particular case and advised AAC or clindamycin to cover anaerobic bacteria [80].

The 2006 SPILF (French Language Infectious Diseases Society) no longer differentiated aspiration pneumonia. However, they consider as special cases institution-acquired pneumonias; we have seen that many of these are probably aspiration pneumonia. They propose several choices: AAC, ceftriaxone or antipneumococcal fluoroquinolones (APFQ) [81].

In reality very few clinical studies are available to support these proposals which are based on knowledge, albeit very imperfect, of the germs allegedly responsible [72]. In their 2003 review of aspiration pneumonia, Johnson and Hirsch cited 18 studies including one dating from 2000 [82].

**Microbiology of aspiration pneumonia**

Despite extensive investigations, a documented bacteriological cause was found in less than one in two cases of community-acquired pneumonia. This is particularly true in the elderly who are often unable to produce a sputum specimen sufficient for microbiological examination. Clinical studies provide conflicting data on the microbial flora responsible for pneumonia in the elderly. In some studies, no significant difference was observed with age [83]. However, in the majority of studies a higher incidence of Gram-negative enterobacteria and S. aureus was observed. Nevertheless, in community-acquired pneumonia in the elderly, pneumococci remain the agents the most commonly involved.

In fact, it is impossible to describe the microbiology of respiratory infections in patients with swallowing disorders because no studies to date have focused on this specific issue. The origin of the pathogens responsible for aspiration pneumonia is the oropharynx. Oropharyngeal flora is dependent on many factors: previous antibiotic treatment, hospitalization [84], institutional living, dependency, and sequelae of stroke contributing to oropharyngeal colonization with enterobacteria and methicillin-resistant S. aureus (MRSA) [85].

The great importance given to anaerobic bacteria in 1970–1980 [86] has reduced in more recent studies [87—89]. This is possibly because transtracheal puncture, an aggressive procedure impaired by false positives [90], has been abandoned. Furthermore, in edentulous patients, anaerobic flora would be reduced. The anaerobic bacteria involved are mainly *Prevotella*, *Peptostreptococcus*, *Porphyromonas* and fusobacteria [91]. Studies are definitely required to better understand the microbiology of aspiration pneumonia in general, and particularly pneumonia in institutionalized elderly patients.

**Probabilistic antibiotic therapy**

When choosing probabilistic antibiotic therapy, the antibacterial spectrum should cover:

- for aspiration pneumonia in community settings or in well elderly patients living in institutions: *Streptococcus pneumoniae*, *Haemophilus influenza*, enterobacteria and anaerobic bacteria, particularly when oral hygiene is poor. The choice may be between AAC, injectable third generation cephalosporins ± imidazoles and APFQ, or ertapenem (a single daily injection). Among the fluoroquinolones, moxifloxacin is the most effective against anaerobic bacteria [92];

- for aspiration pneumonia in institutional settings, the question is whether or not to take into account *Pseudomonas* and/or MRSA. For El Solh, these two bacteria are responsible for treatment failures and admissions to ICU [93]. To take *Pseudomonas* into account, tazocillin (piperacillin + tazobactam) or imipenem should be chosen; the addition of vancomycin is logical when there is a genuine suspicion of MRSA. Taking a sample for bacteriology, possibly endoscopic, is justified in this case, to enable
direct examination and guide the decision, and mainly to readjust the prescription after 48—72 hours of initial probabilistic treatment. The decision to take a sample depends on the treatment plan and obviously other more practical factors: facilities for performing the examination, and ethical issues.

Concerning the prescription, the oral route is possible from the outset in non-severe forms. Parenteral treatments are more aggressive and have a higher risk of side effects. They require discussion on the basis of severity of the clinical picture, and the expectations and willingness of the patients or their family/carers [94]. The switch to oral treatment must be as rapid as possible.

**Question 14: Apart from aspiration pneumonia, when should antibiotics be prescribed?**

**Acute aspiration of gastric contents**

In the acute phase less than 48 hours

In the case of “normal” aspiration of gastric contents, there is no indication for curative or prophylactic antibiotic therapy. This recommendation is shared by three different authors [59, 61, 62, 82, 95]. These authors acknowledge, however, that this attitude is not respected by many practitioners, especially if there are co-morbidities, a precarious state that corresponds well to elderly patients.

Antibiotic therapy can certainly be prescribed when the acid barrier of the stomach is not functional (e.g.: antacids, upper gastrointestinal occlusion, gastrectomy). The antibiotics the most often prescribed are: AAC, injectable third generation cephalosporins, and antipneumococcal fluoroquinolones (APFQ). The risk of *Pseudomonas* or MRSA infection theoretically exists and depends on many factors (prior antibiotic treatment, state of dependence, life in an institution with nosocomial type flora). This risk is taken into account on a case-by-case basis.

After 48 hours

The persistence or the appearance of signs of pulmonary infection is an indication for antibiotic therapy similar to that for aspiration pneumonia. A wait of 24 hours is perhaps more reasonable in elderly and frail patients [62].

**Inhalation of a foreign body**

Emergency endoscopic aspiration is required. For secondary ventilatory disorders, the indication for antibiotic therapy depends on the time to diagnosis and the possibilities of reventilation after endoscopy. Anaerobic bacteria should systematically be taken into account when deciding on treatment (prolonged anaerobiosis distal to the obstruction).

**Disclosure of interest**

The authors declare that they have no conflicts of interest concerning this article.

**KEY POINTS**

- The safety of oropharyngeal swallowing is not compromised simply because of age, in the absence of associated disorders.
- The cough reflex is not affected by age.
- The prevalence of dysphagia is estimated at between 8 and 15% in patients living at home, and 30 to 40% in patients living in institutions, with an increased risk of malnutrition.
- Swallowing disorders concern 50 to 75% of residents in geriatric institutions.
- Swallowing disorders have neurological, muscle, general (diabetes, dehydration, etc.), local and drug-associated causes.
- Information concerning any difficulties with food intake in an elderly person must be communicated to the prescribing physician.
- Investigation of swallowing disorders must include thorough history taking with the patient and/or carers, as well as examination of the three phases of swallowing: preparatory phase, oral phase and pharyngeal phase.
- Swallowing tests are a simple systematic means of detection in populations at risk.
- Further examinations are: videofluoroscopy, endoscopic examination and pharyngoesophageal manometry.
- Management of swallowing disorders must have as its priority maintaining the pleasure in eating and drinking, while guaranteeing a vital necessity.
- “Silent” aspiration must be detected (the importance of pulmonary auscultation); coughing during a meal indicates aspiration, but the absence of cough is not synonymous with satisfactory transit of the food bolus.
- Acute complications of swallowing disorders are tracheobronchial aspiration, Mendelson syndrome, and a clinical picture of lower respiratory tract infection.
- Subacute and chronic complications simulate respiratory disorders.
- The incidence of pneumonia increases with age and is higher in institutional settings.
- Aspiration pneumonia is initially treated with amoxicillin associated with clavulanic acid, but all antibiotic regimens remain empirical.
Swallowing disorders, pneumonia and respiratory tract infectious disease in the elderly e91

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organisms and clinical characteristics and outcome. Medicine 2003;82:159.


