

SPEECH THERAPY

Swallowing disorders: proposal of a method for forensic medicine assessment

I disturbi della deglutizione: proposta di metodologia valutativa medico-legale

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SUMMARY

For a correct classification of dysphagia, morphologic instrumental investigations capable of analysing the anatomical structures of the digestive tract, are undoubtedly essential, but the most important investigations are the functional investigations, such as videofluoroscopy, fiberoptic endoscopic evaluation of swallowing, oro-pharyngo-oesophageal scintigraphy, manometry and pH-metry. Results of these examinations enable us to identify, in patients with dysphagia, the extent of permanent damage, as a consequence of injury to the structures designated to swallowing, must be such that it at least minimally impairs and decreases the relative function, but to a degree that can be detected and, in some manner, measured. From a legal point of view, alterations in swallowing, caused by damage to structures belonging to the respiratory-digestive tract, can be found in crimes against persons and particularly in those involving body injury. In the case of civil, but also in private or social insurance proceedings, it is necessary to distinguish which parameters are to be used as reference for evaluating and quantifying the injury in terms of reimbursement. With the introduction of complete biological well-being, injury is considered as an impairment of the worth and right to enjoy psychological-physical integrity as a quality of life. The criteria currently used internationally take into account the conception of psychological-physical efficiency; nevertheless, in Italian forensic medicine, there is no table that offers a thorough quantification of swallowing modifications, if one excludes oesophageal disorders. Herewith, an evaluation table, dividing oro-pharyngo-oesophageal dysphagia into five, progressively serious classes, is proposed.

KEY WORDS: Swallowing disorders • Diagnosis • Forensic medicine evaluation

RIASSUNTO

Per un corretto inquadramento della disfagia in primo luogo sono certamente indispensabili indagini strumentali di tipo morfologico, ma particolarmente di tipo funzionale, come la videofluoroscopia, la videoendoscopia, la scintigrafia oro-faringo-esofagea, la manometria e la pH-metria. I risultati di questi esami ci permettono di individuare, nel paziente disfagico, la presenza di un risentimento funzionale in grado, anche se minimo, di incidere in qualche modo sulla capacità e validità biologica quotidiana, modificando in senso peggiorativo la qualità della vita. In sede penale le alterazioni della deglutizione possono trovare una collocazione nei delitti contro la persona ed in particolare in quelli di lesione personale. In ambito civile ed anche assicurativo-previdenziale occorre individuare i parametri di riferimento per commisurare e quantizzare il danno come risarcimento. Con l'introduzione dei concetti sulla validità biologica si prende in considerazione la compromissione del valore uomo ed il suo diritto all'integrità psicofisica identificabile come qualità della vita esistenziale. In generale i criteri valutativi, anche internazionali, tengono attualmente conto del concetto di efficienza psico-fisica, tuttavia attualmente non esiste in Italia in ambito medico-legale una tabella che quantizzi in modo esaustivo le alterazioni della deglutizione, se si escludono le patologie a carico dell'esofago. Noi prospettiamo una valutazione tabellare per la disfagia oro-faringo-esofagea in cinque classi di progressiva gravità.

PAROLE CHIAVE: Disturbi della deglutizione • Diagnosi • Valutazione medico-legale

Acta Otorhinolaryngol Ital 2007;27:129-133

Introduction

Swallowing is a very complex process that involves numerous nerve and muscle structures in a co-ordinated and sequential manner and disorders in swallowing are, consequently, classified into seven stages according to the anatomical areas involved in the dysphagia ¹ (Table I).

At present, forensic evaluation of dysphagia takes into account mainly the oesophageal component of the condition,

without considering the other anatomical structures and functions involved in swallowing, particularly as far as concerns the oro-pharyngo-laryngeal aspects. On the contrary, in our opinion, an overall assessment of dysphagia should be made and should no longer be considered merely an altered progression of food through the oesophagus but rather a condition involving an extremely complex and articulated process that needs the sequential co-ordination of numerous nerve and muscle structures ranging from the oral to the gastric area.

Table I. Seven phases of swallowing.

Advanced phase
Extraoral preparation
Oral preparation
Oral
Pharyngeal
Oesophageal
Gastric

In the case of a patient with dysphagia, the first important step is to look for some causal link between a legally important penal, civil, private or social insurance event and modifications in swallowing. Secondly, attention should focus on assessing the damage with reference to the above-mentioned legal fields.

Hence, if there is a swallowing disorder, it has to be proven and any causal correlation with the damaging event has to be demonstrated.

The fundamental element for correct evaluation of dysphagia is meticulously acquired diagnostic-clinical information, which must necessarily include an accurate aetiopathogenic analysis based on fully documented, objective and repeatable semeiological studies.

The clinical profile of dysphagia still remains controversial; nevertheless, the majority of Authors maintain that the most useful classification, from a clinical-diagnostic point of view, is the aetiological classification (Table II).

For a correct classification of dysphagia, the first important step is to scrupulously examine the patient from a semiological-clinical point of view, for which no particular instruments (bedside examination) are required. Albeit, and especially for forensic studies, morphologic instrumental investigations, capable of objective and repeated analyses of the anatomical structures of the digestive tract, such as endoscopy and computed tomography (CT) or magnetic resonance imaging (MRI), are undoubtedly essential, but the most important investigations are those of a functional nature that can supply information on the patient's ability to swallow.

Table II. Aetiological classification of the types of dysphagia.

Aetiology
Deformative
Immunitary
Degenerative
Infective
Vascular
Dysmetabolic
Toxic
Traumatic
Iatrogenic

Instrumental methods for studying swallowing function

Videofluoroscopy (Fig. 1) is currently considered the gold standard for diagnosing and subsequently planning treatment in cases of oropharyngeal dysphagia²⁻⁵; nevertheless, since it is difficult to repeat on account of exposure of the patient to further high dosages of radioactivity, it is not considered the ideal method, especially during a follow-up programme requiring repeated radiological examinations. Other limitations concern the patient's collaboration (he/she must be able to be transported to the department where the examination is to be performed), the examination does not reveal if any saliva has been inhaled and it does not quantify the possible tracheal-bronchial inspiration of the food bolus.

Fiberoptic endoscopic evaluation of swallowing (FEES) is now the first method routinely used in dysphagic patients since it is easy to use, is well tolerated by the patient (bedside examination is possible) and is economical (Fig. 2). When the tip of the endoscope is brought into contact with

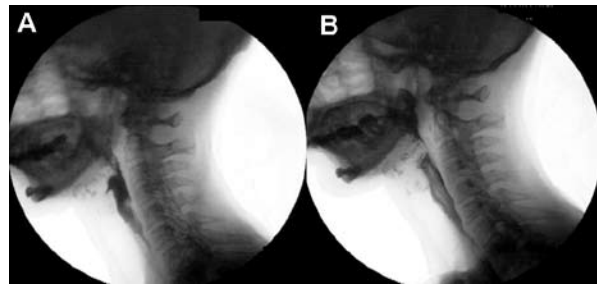


Fig. 1. Videofluoroscopy: patient submitted to extended tonsillectomy through mandibulotomy after pre-operative radiotherapy for carcinoma in right tonsil area. Videofluoroscopic examination revealed good functional compensation in patient's swallowing both a liquid bolus (A) and a semi-solid bolus (B) following rehabilitation speech therapy.

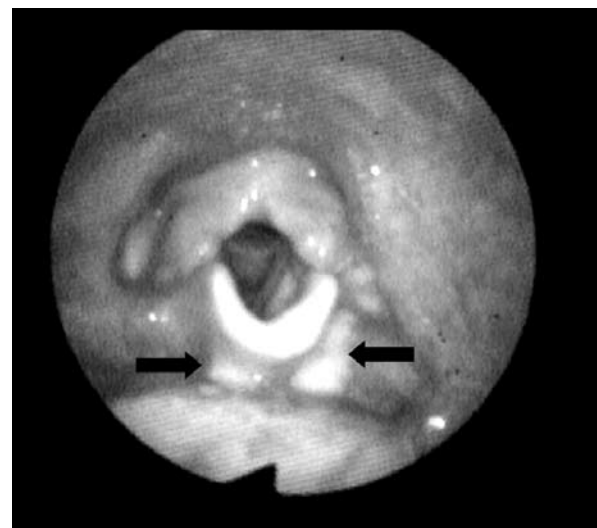


Fig. 2. Fiberoptic endoscopic evaluation of swallowing: solid bolus staining in laryngeal regions (black arrows) in patient with Amyotrophic Lateral Sclerosis.

the various anatomical structures of the hypopharynx and the larynx, this method also consents testing their sensitivity. Moreover, videofluoroscopy and FEES correlate well in demonstrating pathological aspects such as inspiration of the food bolus in the respiratory tract and the presence of remains of the bolus in the pharynx⁶⁻⁸.

Oro-pharyngo-oesophageal scintigraphy (OPES) has recently been introduced for studying dysphagia. This examination is particularly indicated for analysing functional disorders during the various stages of swallowing since it allows a semi-quantitative evaluation of the various stages. In particular, it permits calculation of oral transit time (OTT), pharyngeal transit time (PTT) and oesophageal transit time (ETT) of the bolus, the oral retention index (ORI), pharyngeal retention index (PRI) and oesophageal retention index (ERI), as well as revealing and quantifying the amount of any bolus inhaled into the trachea-bronchial tract⁹⁻¹⁰ (Fig. 3). OPES also supplies qualitative information concerning swallowing, such as the bolus dropping from the oral cavity before swallowing is performed, fragmentation of the bolus in the pharynx because of a reduction in tongue thrust (which causes swallowing to be repeated twice or thrice), pharynx-oral reflux or gastro-oesophageal reflux of the bolus or disorders in oesophageal motility¹¹⁻¹².

Manometry and pH-metry are useful diagnostic tools for assessing oesophageal dysphagia, even if they should not be considered for the initial investigations in patients with this condition¹³⁻¹⁵. In fact, dysphagia of an oesophageal nature should induce the physician to consider all organic disorders that may hinder the transit of a food bolus (carcinoma of the oesophagus, benign tumours, oesophageal membranes, Zencker's diverticulum, congenital stenoses, aftermaths of surgery, etc.) since suspicion of a diagnosis can lead to the correct choice of instruments capable of providing morphological images (endoscopy of the digestive tract, ultrasonography, CT and MRI)¹³.

The importance of manometry for studying functional alterations in the oesophagus has been well established, but this is not the case in studies on the pharynx or superior

oesophageal sphincter (SES) due to the fact that variations in muscle tone, in these regions, are much more rapid (and, therefore, difficult to detect) than those found in the oesophageal area, where the muscles are smooth¹⁶.

Twenty-four hour pH-metry performed in the out-patient department is currently considered the most sensitive test for diagnosing gastro-oesophageal reflux and allows correlating the symptoms to the reflux with 95% specificity and 90% sensitivity¹⁶⁻¹⁷.

Forensic medicine considerations

The importance and consequent value of any impairment caused by swallowing disorders changes according to the legal sphere involved.

In fact, from a penal point of view, alterations in swallowing caused by damage to respiratory-digestive tract structures (which have multi-functional characteristics since they have several physiological tasks) can be found in crimes against subjects and particularly in those involving body injury or at least in crimes where body injury is a relevant circumstance. In penal law, an offence to the well-being of a person is the objective element of a crime causing personal injury¹⁸.

In the case of civil, and also in private or social, insurance proceedings, the assessment of compensation for personal damages involving modifications to swallowing is more problematic and complex. In these cases, it is necessary to distinguish which parameters are to be used as reference for evaluating and quantifying the injury in terms of reimbursement.

The extent of permanent damage, as a consequence of injury to the structures designated to swallowing, must be such that it at least minimally impairs and decreases the relative function, but to a degree that can be detected and, in some manner, measured¹⁸⁻¹⁹.

In times before biological damage was introduced as a recognised parameter, only a somewhat abstract reduction in an individual's capacity to perform any aspecific work, was taken into account in the evaluation of compensation.

With the introduction of complete biological well-being, being considered and acknowledged as the fundamental condition, even though it varies substantially from one person to another according to the individual biological constitution, injury is no longer considered in relationship to the potential and general working capacity of an individual but rather as an impairment of his/her worth and of his/her right to enjoy psychological-physical integrity as a quality of life.

Hence, even when considering the aspects of biological damage, the slightest disablement of significance to an individual's earnings (and, therefore, liable for reimbursement) cannot be correlated merely with an anatomical modification but should necessarily entail a degree of impairment and relative functional impediment which, even if minimum, somehow affects him/her in the biological capacity and potentiality of his/her daily life and consequently worsens the quality of life.

This is why it is important to carry out functional tests, such as videofluoroscopy, FEES, oro-pharyngo-oesophageal scintigraphy, manometry and pH-metry.

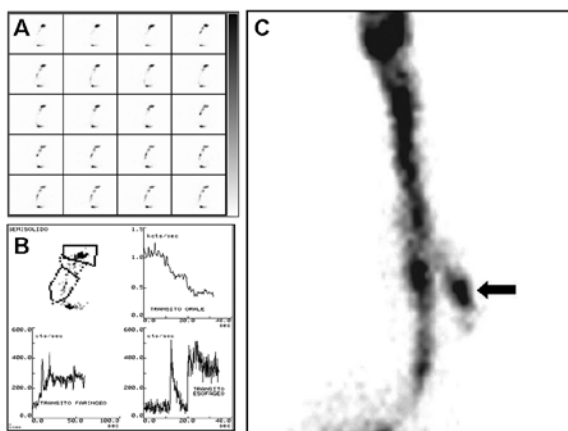


Fig. 3. Oro-pharyngo-oesophageal scintigraphy: scintigraphic examination performed with semi-solid bolus. Dynamic images (one frame/sec) of transit slowed down mainly in oro-pharyngeal area of patient with Amyotrophic Lateral Sclerosis (A) and relative activity/time curves (B). Scintigraphic image of tracheal-bronchial inhalation of liquid bolus (black arrow) in same patient (C).

Table III. Table proposed by B. Fattori, A. Nacci.

Class I (Biological damage < 5%)
<ul style="list-style-type: none"> – Slight narrowing of the oro-pharyngo-oesophageal tract with transient minor degree dysphagia for solid foods or slight neuromotor and/or sensitive deficit of the oro-pharyngo-oesophageal tract with transient and minor degree dysphagia for liquids. – Not requiring specific diet. Pharmacological treatment unnecessary or, if needed, is very efficacious. – No change in general health conditions. – Daily activities not affected.
Class II (Biological damage 6-20%)
<ul style="list-style-type: none"> – Moderate narrowing of the oro-pharyngo-oesophageal tract with modest but persistent dysphagia for solid foods or medium degree neuromotor and/or sensitive deficit of the oro-pharyngo-oesophageal tract with modest but persistent dysphagia in prevalence for liquids. – No signs of tracheal-bronchial penetration and aspiration. – Dietetic and/or pharmacological treatment necessary. – General health: no signs of malnutrition. – Daily activities only minimally affected.
Class III (Biological damage 21-35%)
<ul style="list-style-type: none"> – Continuous or almost continuous significant dysphagia. – Considerable stenosis of the oro-pharyngo-oesophageal tract with great difficulty in swallowing solid and/or semi-liquid food. – Significant motor abnormalities at the basis of the dysphagia that can be solved only with postural manoeuvres or with rehabilitation techniques. – Signs of tracheal-bronchial penetration and/or aspiration (cough) of the bolus during intake of food. – General health conditions undermined, with loss of between 10 and 20% of ideal body-weight. – Need of a specific diet, with repercussions on the psychological-physical conditions of the patient. – Need of pharmacological and/or surgical treatment. – Significant motor abnormalities originating in the dysphagia, which are overcome only with postural manoeuvres or rehabilitation techniques. – Daily activities appreciably affected.
Class IV (Biological damage 36-60%)
<ul style="list-style-type: none"> – Severe dysphagia, continuous or almost continuous. – Significant stenosis or serious motor abnormalities of the oro-pharyngo-oesophageal tract, sialorrhoea, consumption of only liquid foods. – Tracheal-bronchial penetration and aspiration (cough) of both a food bolus and of saliva. – General health considerably affected. Loss of over 20% of ideal body weight. – Pharmacological and/or surgical treatment required and not entirely efficacious. – Evolution towards serious complications such as inhalation of the food bolus in the lower respiratory tract, with risk of <i>ab ingestis</i> pneumonia. – Daily activities considerably affected, although the patient continues to be self-sufficient.
Class V (Biological damage > 60%)
<ul style="list-style-type: none"> – Severe dysphagia to the extent that general health is seriously undermined. – Stenosed blockage of part of the oro-pharyngo-oesophageal tract, with absolute impossibility to take food through the mouth. – Need of a gastrostomy for feeding and/or need for associating this with parenteral administration of food. – General health of the patient seriously impaired. – Pharmacological treatment with slight or no effect, only able to alleviate the symptoms. – Daily activities seriously affected, even total disablement and the need for continuous care.

The second aspect to be taken into account is the ability and possibility of the injured subject to produce and guarantee an income. This means that his/her habitual working activity must be evaluated, also taking into consideration the subject's skills and qualifications or level of employment¹⁹. Assessment of a swallowing disability, according to the traditional definitions and using the most reasonable criteria,

should be performed when the disorder has stabilised, when the disorder is fully established and after maximum rehabilitation has been performed²⁰.

The criteria currently used at international level take into account the conception of psychological-physical efficiency (Melennec's international Barèmes or the American Medical Association tables – A.M.A.). Nevertheless, in Italian

forensic medicine, there is no table that provides a thorough quantification of swallowing modifications, that is, if one excludes oesophageal disorders¹⁹.

According to Bargagna et al.¹⁹, although not discussing only dysphagia, the following parameters should be considered when evaluating diseases of the digestive tract:

- a) the presence and degree of the symptoms and clinical signs of the basic disease;
- b) the effect of these on the patient's general health conditions and, in particular, on his/her ideal body-weight and, therefore, on his/her psychological-physical well-being;
- c) the need for dietetic, pharmacological and/or surgical treatment. In fact, one of the indices (though insufficient for a forensic assessment of the limitations caused by swallowing disorders) is the fact that the patient needs to pay particular attention to the type and consistency of the food taken;
- d) as a consequence, there are restrictions and necessary

requirements in the patient's diet, and this, in itself, is a reasonable and objective criterion for evaluating permanent damage since it represents what the patient can and cannot do (limitations to daily life).

Bargagna et al.¹⁹ classify digestive tract diseases into five, progressively serious classes. For the most invalidating circumstances, they propose a value of > 60%.

For an overall assessment of dysphagia (not limited, therefore, only to diseases in the oesophagus), in our opinion the entire oro-pharyngo-oesophageal tract should be considered as a single functioning structure capable of producing dysphagia because of alterations in any one of its areas, from the oral cavity to the terminal part of the oesophagus.

In this respect, we believe there should be an assessment Table (Table III) for oro-pharyngo-oesophageal dysphagia that takes into account the majority of the considerations in the two tables proposed by Bargagna et al. for the digestive tract and for the oesophagus¹⁹.

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Received: October 2, 2006 - Accepted: March 5, 2007