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Dysphagia in the burn patient: Experience in a National Burn Reference Centre

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ABSTRACT

Introduction: Major burn patients are exposed to different invasive procedures for wound management or medical stabilization. Dysphagia is a frequent adverse effect of burns in the presence of invasive airway procedures and facial wounds.

Objective: To estimate the prevalence of dysphagia, to determine the degree of severity, and to report clinical characteristics that could contribute to the appearance of dysphagia in patients admitted to a National Burn Reference Centre.

Methods: An observational cross-sectional study was conducted in a burn reference centre over a 6-month period. All patients admitted to the burn service of a National Reference Centre were included. A clinical bedside swallowing assessment was performed in patients referred to a Speech-Language Pathologist (SLP). The presence or absence of dysphagia was evaluated, and the degree of severity was measured according to the Dysphagia Outcome and Severity Scale (DOSS). **Results:** Fifty-four participants were recruited. The prevalence of dysphagia over a 6-month period was 27.78% (n=15) of the total burn patients admitted to the Burn Unit. The severity of dysphagia varied from mild (26.7%), mild-moderate (33.3%), moderate (20%), moderate-severe (13.3%), to severe (6.7%). All dysphagia patients had orotracheal intubation history with an average length of 18 days, as opposed to the non-dysphagia group, of which 75% of the participants had orotracheal intubation history for an average of 8.5 days. Statistically non-significant associations were found between dysphagia and demographic aspects or clinical characteristics ($p > 0.05$).

Conclusion: 27.78% of burn patients presented dysphagia, with differences in the degree of severity. Presence and duration of orotracheal intubation stands out as a condition of interest. The SLP inclusion in the burn team is presented as a valuable input in order to minimize risks associated with swallowing impairment.

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1. Introduction

The complexity of burn injuries benefits from early interdisciplinary treatment. Comprehensive management allows for an

optimal recovery, reducing mortality [1] and contributing to a decrease in functional limitations, one of the crucial factors that affect quality of life [2,3].

The Speech-Language Pathologist's participation in the burn care team dates back to the late 80s with particular

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emphasis on communication [4], gradually contributing to physical and functional recovery [5]. Currently, the role of Speech-Language Pathologist (SLP) is focused on prevention of orofacial contractures, management of tracheostomy, intervention of communication disorders, and swallowing assessment and treatment [6,7].

Prior research has suggested that difficulty during swallowing is a common adverse effect among burn patients [8–12]. These studies have addressed the characterization of clinical manifestations of this condition, termed dysphagia, and SLP management. Dysphagia becomes a frequent condition in the severe burn patient because of the presence of orofacial burns, artificial airway devices, and prolonged mechanical ventilation [7,9,12–14]. An impact on the oral stage of swallowing due to orofacial burns has been reported, affecting the efficiency of deglutition [11,13–15]. Moreover, direct implications in deglutition and communication in the presence of prolonged orotracheal intubation have been shown, as a result of pharyngeal and laryngeal abnormalities [15–17]. A previous systematic review shows that the incidence of dysphagia after endotracheal intubation ranges from 3% to 62% [18] and even a later study exhibits an 84% [19].

Dysphagia is also associated with the risk of dehydration and nutritional deficiencies, as well as aspiration pneumonia [20–23]. Swallowing impairment is especially relevant in the burn patient given the presence of a hypercatabolic state [24], which modifies inflammatory signalling and leads to a high susceptibility to infections due to dermal barrier disruption and immunosuppression [25,26]. The restoration of a safe oral intake promotes the improvement of nutritional status and reduces the associated complications mentioned above.

An important factor to improve the management of patients with dysphagia has become the intervention of SLPs, reducing sequelae [8,11,27].

In Chile, The National Health System has developed a specific plan with legal entitlements to access, universal coverage, and explicit guarantees in health regarding opportunity, access, and financial support. This plan comprises a group of 80 health conditions [28], with major burns included since 2007 [29]. To date, SLPs are not included as a mandatory part of the burn team within public policies related to burn patients yet [30,31] (Table 1). This issue might be caused by the lack of knowledge about the SLP's role in burn units and by the scarce review of evidence that highlights the magnitude of

Table 1 – Summary of the national system plan for burn patients [31,37,52].

Who is included?	All people who suffer burns that can compromise life or leave severe and permanent functional sequelae
Beneficiaries	<ul style="list-style-type: none"> • Paediatric and adult patients with severe burns • Paediatric and adult patients with critical burns • Paediatric and adult burn patients with exceptional probability of survival • Respiratory burns in paediatric or adult patients • Digestive burns in paediatric or adult patients
Guarantees of access	Patients must have access to treatment and follow-up when inclusion criteria in Administrative and Medical Technical Standard are met
Guarantees of opportunity	Treatment <ul style="list-style-type: none"> • Admission in a specialized centre before 72h after diagnostic confirmation Follow-up <ul style="list-style-type: none"> • First session before 15 days after medical indication
Guarantees of financial protection	<ul style="list-style-type: none"> • Beneficiaries A^a and B of The National Public Health System = 0% co-payment (Free) • Beneficiaries C of The National Public Health System = 10% co-payment • Beneficiaries D of The National Public Health System or subscribed particular health system = 20% co-payment
Steps	<ul style="list-style-type: none"> • Reanimation and initial management • Intrahospital treatment • Rehabilitation
Admission criteria for a reference centre	<ul style="list-style-type: none"> • Severity index greater than 70 points or burns type AB or B with more than 20% of Total Body Surface Area (TBSA) • Age over 65 with 10% of TBSA of burns type AB or B • Injury on airway tissues • High voltage electrical burn • Polytraumatized burn patient • Burn patient with severe associated pathologies
Professionals included	<ul style="list-style-type: none"> • Medical staff (Plastic surgeons, Emergency physicians, Anaesthesiologists, Intensive care physicians, Psychiatrist, among others) • Nurses • Respiratory and physical therapists • Occupational therapists • Psychologists

^a Classification A, B, C and D depends on the income tranche of the beneficiary.

clinical conditions that can be addressed by SLPs, especially when working with this population.

Additionally, little attention has been devoted to estimate the frequency of dysphagia in burn patients. The prevalence [32] and incidence [33] of dysphagia have been estimated. Risk factors for dysphagia in burn patients have also been studied [33-35]. However, the evidence remains scarce.

This study aims to estimate the prevalence of dysphagia, to determine the severity of dysphagia, and to report clinical features that could contribute to the occurrence of dysphagia in patients admitted to a National Burn Reference Centre and referred to Speech-Language Assessment.

2. Methods

2.1. Participants

An observational cross-sectional study was conducted over a 6-month period (June to November 2015). All the patients admitted to the Burn Service of the Public Assistance Emergency Hospital (HUAP, Hospital de Urgencia Asistencia Pública in Spanish) were considered for the study. The HUAP is the National Reference Centre for burns in adults. About 90% of severe cases are admitted to this tertiary service [36], which is the only alternative for the public healthcare system beneficiaries, and thus receives patients from all over the country. The Centre receives all adult patients that meet the Major Burn criteria established in the National Clinical Guidelines [37] (Table 1).

Based on our clinical experience, current evidence of dysphagia risk factors in burn patients [33-35,38] and in agreement with the referral criteria of the Australian & New Zealand Burn Association (ANZBA allied health guidelines) [39], patients who presented one or more of the following characteristics were referred to SLP assessment: head and neck burn, orotracheal intubation over 48h, inhalation injury,

chemical intake, tracheostomy, and patient, caregiver, family or healthcare personnel swallowing complaints. Therefore, patients who did not present these characteristics were not considered for the clinical assessment, according to the hospital procedures. In addition, to ensure that dysphagia was attributable to the acute burn injury and its management, patients with neurological disorders that could influence swallowing performance or those with a prior history of dysphagia were excluded. A total of 23 patients were considered for descriptive analysis (Fig. 1).

2.2. Procedures

A SLP conducted the swallowing assessment in hemodynamic and respiratory stable extubated patients that were able to maintain alertness during the procedure. Clinical assessment of swallowing included:

- Review of medical records and relevant information registry: medical history; burn information related to data of burn injury, including extension (Total Burn Surface Area or TBSA), depth of burn (A, AB, or B) and localization of injury (referred to body areas); presence/absence of inhalation injury; medical management during hospitalization, such as feeding tubes and orotracheal intubation length; airway conditions; and skin grafts, among other relevant details.
- Functional swallowing-related features: an examination of orofacial musculature and contractures, screening of cranial nerves involved in swallowing, cough protective reflex, and glottal function (or voice quality).
- Swallowing assessment through the progressive intake of two different consistencies (water and pudding): the selection of these consistencies was decided considering the need of high contrasted reference sources despite limited resources. Only these two consistencies were initially evaluated as a standardized procedure applicable

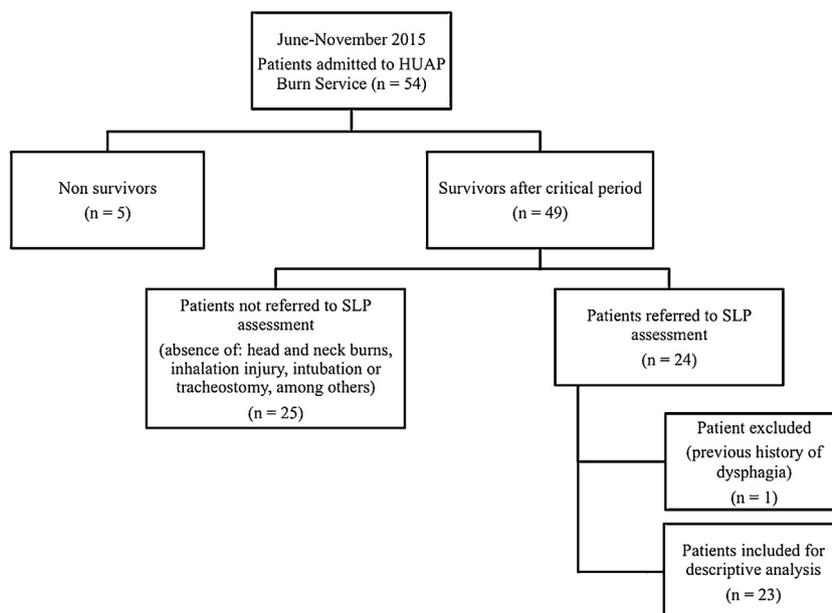


Fig. 1 – Flow chart showing patient inclusion in the study.

to all patients, including edentulous patients. A high percentage of the sample showed considerable tooth loss, preventing the evaluation of solids. Later, in the course of therapy, it was possible to evaluate and incorporate solids and other consistencies in cases where dental prostheses were available. The presence of wound bandages on neck and arms during the assessment prevented pulse oximetry monitoring and cervical auscultation in some cases. Therefore, these results were not considered for analysis. Due to the absence of equipment in the hospital, an instrumental swallowing assessment was not used in the present study.

After the assessment, the degree of severity of dysphagia was rated according to the “Dysphagia Outcome and Severity Scale” (DOSS) [40], which consists of a descendant 7-point scale that ranges from the absence of disturbances (normal swallowing function) to severe dysphagia (Table 2).

This study received the Central Metropolitan Health Service Ethics committee approval (SSMC 598).

2.3. Statistical analysis

Data were collected in a database and analysed with descriptive statistics. The Mann-Whitney U test, Chi-Square, and Fisher’s Exact Probability test were performed, using the Statistical Package for Social Science (SPSS) software version 22.0. Statistical significance was set at $p < 0.05$.

Table 2 – Dysphagia outcome and severity scale (DOSS) [40].

Full per-oral nutrition (P.O):	
Normal diet	
Level 7	Normal in all situations Normal diet – No strategies or extra time needed
Level 6	Within functional limits/modified independence Normal diet, functional swallow
Full P.O: Modified diet and/or independence	
Level 5	Mild dysphagia Distant supervision may need one diet consistency restricted
Level 4	Mild-moderate dysphagia Intermittent supervision/cueing, one or two consistencies restricted
Level 3	Moderate dysphagia Total assist, supervision, or strategies, two or more diet consistencies restricted
Non-oral nutrition necessary	
Level 2	Moderately severe dysphagia Maximum assistance or use of strategies with partial P.O. only (Tolerates at least one consistency safely with total use of strategies)
Level 1	Severe dysphagia NPO: Unable to tolerate any P.O. safely

3. Results

A total of 54 patients were admitted in the service during the 6-month period of the study, 5 of whom deceased. Of the 24 patients who met the clinical assessment of swallowing criteria, one presented a prior history of dysphagia. A total of 23 patients were considered for descriptive analysis (Fig. 1).

3.1. Demographic and clinical characteristics

Table 3 provides sample characteristics for the 23 participants. The analysis sample consisted of 16 males (69.6%) and 7 females (30.4%), with a median age of 52 years old (SD=15.67) ranging from 18 to 83 years old. Thermal injury was the cause of burn in all cases. Fire was the most frequent source (69.6%), followed by a combination of fire and flash (17.4%), scald (8.7%) and flash (4.3%) (Table 4).

Regarding the extension of the burn, it ranges from 6 to 53% TBSA (median=26.85%; SD=15.87). Facial burns were found in 15 patients (65.2%) and 7 patients (30.4%) were diagnosed with inhalation injury, in addition to cutaneous burns. An inhalation injury diagnosis was made upon admission to the Centre, based on clinical symptoms and laryngoscopy or bronchoscopy findings. Orotracheal intubation was done for 21 patients (91.3%) with a range of 2–45 days of length (median=7 days, SD=12.86 days). Only one patient underwent tracheostomy for a period of 17 days (Table 4).

3.2. Prevalence of dysphagia and degree of severity in major burn patients

The prevalence of dysphagia over a 6-month period was found to be 27.78% of the total burn patients admitted to the Burn Unit. Nevertheless, the proportion of dysphagia in patients referred to SLP was 65.2%, showing a high percentage of cases in the at-risk population.

The severity of dysphagia differs among patients. Twenty-six point seven percent (26.7%) of patients had mild dysphagia (level 5), whereas 33.3% of patients had mild to moderate dysphagia (level 4), followed by 20% of moderate (level 3) and 13.3% of moderate to severe dysphagia (level 2) and 6.7% severe dysphagia (level 1) (Fig. 2).

3.3. Characterization of dysphagia and non-dysphagia groups

Differences between subjects with dysphagia ($n=15$) and without swallowing impairment ($n=8$) were observed. However, there is no association between dysphagia and variables related to demographics and clinical characteristics (results statistically non-significant, $p > 0.05$) (Table 5).

A slightly higher median age in the first group (54 years) compared to the second group (45.5 years) was found. Minimal differences of TBSA mean values among dysphagia and non-dysphagia groups were found, with both groups belonging to the Major Burn Category. A predominance of fire aetiology was established in both groups. Moreover, a high frequency of facial burns was found. Inhalation injury was scarce in both groups (Table 5).

Table 3 – Characteristics of the Speech-Language Pathologist assessed patients.

Subject	Gender	Age (years)	Aetiology agent	TBSA (%)	Burn degree	Facial burn	Inhalation injury	Orotracheal length (days)	TQT (days)
1	M	53	Fire	24	AB-B/B	A	A	17	0
2	M	40	Fire	45	AB-B/B	P	A	19	0
3	M	35	Fire	31	AB-B	P	A	7	0
4	F	83	Scald	6	B	A	A	20	0
5	M	54	Fire	35	AB-B/B	A	A	28	0
6	F	18	Fire	32	AB-B	P	A	5	0
7	F	52	Scald ^a	38	AB-B	A	A	0	0
8	M	41	Fire	41	AB-A/AB-B/B	P	A	29	0
9	M	55	Fire	9	AB-B	P	P	40	17
10	M	59	Fire	10	B	A	A	26	0
11	M	59	Flash	13.5	AB-B/B	P	P	5	0
12	M	28	Fire/flash	51	AB-B/B	P	P	5	0
13	M	53	Fire	12	AB-A	A	A	2	0
14	M	44	Fire	53	AB-A/B	P	P	6	0
15	M	45	Fire	7	AB-A/AB-B	P	P	8	0
16	M	61	Fire	6	AB-B	P	A	2	0
17	F	40	Fire	50	AB-B/B	P	P	7	0
18	F	79	Fire/flash	7	AB-A/AB-B	P	A	5	0
19	F	25	Fire	35	AB-B/B	A	A	45	0
20	M	46	Fire/flash	23	AB-A/AB-B	P	A	0	0
21	F	70	Fire	18	AB-A	P	A	28	0
22	M	54	Fire	35	AB-B/B	A	A	7	0
23	M	49	Fire/flash	36	AB-A/AB-B	P	P	10	0

TBSA=Total Burn Surface Area; TQT=Tracheostomy; M=Male; F=Female; P=Presence; A=Absence.

^a Complaints expressed by the healthcare personnel.

All cases in the dysphagia group had a history of oro-tracheal intubation compared to 75% in the non-dysphagia group. Otherwise, dysphagia was found in 71.4% (n=15) of the total OTI cases (n=21).

Table 4 – Descriptive statistics of the studied variables (n=23).

Variable	Mean	Median (SD)	Range	[95% C.I.]
Age (years)	49.69	52 (15.67)	18-83	41.8-54.7
TBSA (%)	26.85	31 (15.87)	06-53	12.4-35.7
Orotracheal intubation (days)	13.95	7 (12.86)	02-45	5.0-19.7
Variable	n (%)			
Gender	Male	16 (69.6)		
	Female	7 (30.4)		
Burn aetiology	Fire	16 (69.6)		
	Flash	1 (4.3)		
	Scald	2 (8.7)		
	Combined (Fire/flash)	4 (17.4)		
Facial burn	Present	15 (65.2)		
	Absent	8 (34.8)		
Inhalation injury	Present	7 (30.4)		
	Absent	16 (69.6)		
Orotracheal intubation	Present	21 (91.3)		
	Absent	2 (8.7)		
Tracheostomy	Present	1 (4.35)		
	Absent	22 (95.65)		

The most important difference lies in the length of oro-tracheal intubation, with a median of 17 days (SD=14.02) in the dysphagia group and 6 days (SD=6.3) in the group without dysphagia. However, differences were statistically non-significant ($p > 0.05$) (Table 5).

4. Discussion

The inclusion of Speech-Language Pathologists in the burn teams is a rising practice. Australia, Brazil, and United States are the major contributors to the available scientific evidence. Nevertheless, there is still scarce evidence in other countries. The aims of this study were to estimate the prevalence of dysphagia among burn patients admitted to our National Burn Reference Centre, to determine the degree of severity of dysphagia and to report clinical features to which burn patients are exposed.

Several studies have shown that dysphagia is a frequent adverse condition among this population [9,10,11,15,32,41]. According to our findings, 27.78% of participants presented dysphagia with different degrees of severity.

To date, there is only one study that estimates the prevalence of dysphagia in burn patients [32]. The study found 46.97% of dysphagia in older patients (>75 years) with severe burns [32]. However, it has been shown that the physiology of swallowing undergoes changes with age, increasing the risk of developing dysphagia [42,43]. Therefore, the aforementioned prevalence rates are not comparable to our results considering the differences in sample characteristics, particularly the age of participants.

In addition, a previous study estimated the number of new cases of dysphagia in a burn population [33]. Despite

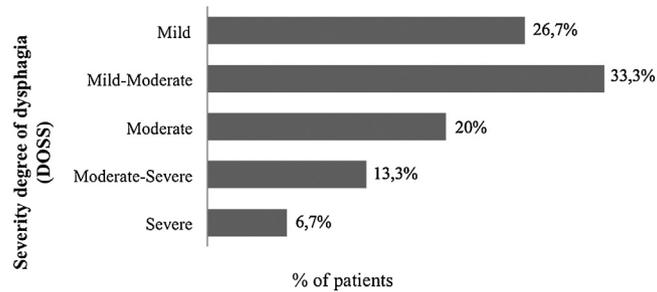


Fig. 2 – Severity degree of dysphagia in our group of major burn patients.

Table 5 – Characterization of dysphagia (n=15) and non-dysphagia (n=8) groups.

Variable	Dysphagia			Non-dysphagia			p-Value
	Mean	Median (SD)	[95% C.I.]	Mean	Median (SD)	[95% C.I.]	
Age (years)	53.67	54(16.48)	44.5-62.8	42.25	45.5 (11.49)	32.6-51.8	Not sig.
TBSA (%)	26.85	24 (17.58)	17.1-36.6	28.00	31.5 (13.09)	17.1-34.9	Not sig.
Orotracheal intubation (days)	18.00	17 (14.02)	10.2-25.8	6.40	6.0 (6.30)	1.1-11.7	Not sig.
Variable	Dysphagia		Non-dysphagia		p-Value		
	n	%	n	%			
Gender	Male	10	66.7	6	75	Not sig.	
	Female	5	33.3	2	25		
Burn aetiology	Fire	11	73.3	5	62.5	Not sig.	
	Flash	1	6.7	0	0		
	Scald	1	6.7	1	12.5		
	Combined (Fire/flash)	2	13.3	2	25		
Facial burn	Present	9	60	6	75	Not sig.	
	Absent	6	40	2	25		
Inhalation injury	Present	5	33.3	2	25	Not sig.	
	Absent	10	66.7	6	75		
Orotracheal intubatio	Present	15	100	6	75	Not sig.	
	Absent	0	0	2	25		
Tracheostomy	Present	1	6.7	0	0	Not sig.	
	Absent	14	93.3	8	100		

methodology differences between the aforementioned study and the present study (incidence versus prevalence rates), there are some similarities within the demographics and characteristics of the sample to be examined. Rumbach et al. estimate that the incidence of dysphagia was 11.18% in a period of two years among 438 patients admitted for thermal burn injury [33]. The present study found 27.78% of participants presented dysphagia with different degrees of severity. In our opinion, it is important to also consider the disparities between both studies, such as the characteristics of each centre, demographic aspects of the sample, selection of the study group, burn aetiology and localization, as well as differences in the length of time considered for the study.

As previously mentioned, the HUAP receives about 90% of the patients who suffered severe burns in the country. Taking this into account, it is possible to notice clinical and demographic differences between the present sample and the Rumbach et al. cohort [33]. Thus, relative frequency values

in the present study are higher in terms of aetiology of the injuries (69.6% of fire burns versus 36.76%), total burn surface area (TBSA) (26.8% versus 10.46%), inhalation injury (30.4% versus 6.85%), orofacial burn (65.2% versus 31.4%) and orotracheal intubation (91.3% versus 12.32%).

The management of burn patients with orofacial burns, inhalation injury, or TBSA >18% usually receives intensive care and mechanical ventilation. Prior research has shown several risk factors that contribute to the development of dysphagia in burn patients. The need of intensive care, mechanical ventilation, inhalation injury, TBSA >18% and the presence of orofacial burns are the most important risk factors for developing dysphagia [33-35,38]. Rumbach et al. [33] found an increase in the probability of presenting dysphagia of 16.52 times in patients who present >18% TBSA, compared to those with ≤17.5% TBSA. An increase of each year of age showed a 1.04% times higher risk, whereas a 13-fold higher probability was found in patients with head and neck burns.

Moreover, patients with head and neck injuries might develop skin tightness and contractures, which can further affect the swallowing process [33]. In our study, a non-statistically significant association was found among these variables (i.e., head and neck burn, inhalation injury, mechanical ventilation, and TBSA >18%) and the presence of dysphagia. We suspected that this issue could be explained by the small sample size. Despite the above, the presence of one or more of these conditions in the present sample is in agreement with Rumbach et al. results [33]. Moreover, a substantial relevance might be attributed to these characteristics based on the high percentage of dysphagia (65.2%) of patients referred to SLP assessment.

In particular, the extent of time for the execution of the studies is another factor to be considered. The present study was developed for 6 months, whereas the study of Rumbach et al. lasted 2 years [33]. As a consequence, there are substantial differences in the sample size of the mentioned report compared to our study, which could explain non-statistical differences. The complexity and characteristics of each Centre might affect the results as well. A total of 12 intensive care unit (ICU) beds are available in the Burn Service of the HUAP.

Swallowing assessment in both studies presents some differences as well. Although both studies did not consider the results of instrumental evaluations, the clinical assessment in the present study uses only two consistencies (i.e., water and pudding) to evaluate swallowing function whereas Rumbach et al. included several consistencies (i.e., minced and moist; soft; extremely, moderately and mildly thick, and thin fluids). A major limitation of the present study is the absence of procedures to ensure inter-rater reliability due to the presence of only one SLP in the hospital.

Another important aspect that should be highlighted is the severity degree of dysphagia. Our findings reveal large percentages of mild to moderate dysphagia and a few cases of moderate to severe dysphagia. On the contrary, Rumbach et al. [33] found 40.82% of severe dysphagia, with lower percentages of moderate (30.61%) and mild dysphagia (28.57%). The results of their study were obtained based on a 3-level scale of degree of severity of dysphagia considering oral intake restrictions of food consistencies and fluids. Differences between the mentioned 3-level scale compared to the 7-level scale used in our study become relevant since the latter considers functional aspects of deglutition such as oral retention of bolus, time delay during the process, or the need of assistance during feeding, among others [40]. Therefore, the results of these studies are not comparable.

A variety of factors can contribute to the presence and severity of dysphagia in the burn patient, increasing the risk of complications (i.e., adverse effects) such as inhalation injury, artificial airway (e.g., orotracheal intubation or tracheostomy), catabolism of skeletal muscle, orofacial contracture due to hypertrophic scars or facial skin grafts, in addition to multiple medical and surgical procedures. The use of prolonged orotracheal intubation (OTI) or tracheostomy for airway management is common. The presence of an orotracheal tube can alter the anatomy of the larynx, with adverse vocal and deglutition consequences [12,44]. Moreover, tracheostomy can produce certain alterations to the physiology necessary for swallowing physiology [45],

increasing the emergence of dysphagia. Prior research has focused on the presence of dysphagia following intubation. A systematic review of relevant studies revealed that 3%-62% of new cases of dysphagia occurred after intubation [18]. According to our findings, dysphagia was found in 71.4% of OTI cases. Similarly, a previous study found a likelihood for dysphagia of 84% after extubation, varying in the degree of severity [19]. Furthermore, in our study, all patients who presented dysphagia had a history of OTI. It is necessary to take this finding into account for future studies considering OTI, as well as other factors such as inhalation injury or the presence of a facial burn acting as a cause-effect relation.

As mentioned before, dysphagia can lead to several adverse effects like pneumonia caused by aspiration of food, dehydration, and malnutrition [20,21]. A high proportion of dysphagia within burn patients referred to SLP (65.2%) was found. As a consequence, it is important to ensure an early diagnosis of dysphagia and the subsequent deglutition rehabilitation. This could allow us to correctly determine the precise moment to restore oral nutrition and hydration, reducing the risk of pneumonia. The ability to do so is particularly important given the fragility of the burn patient, especially in order to reduce risk factors that increase mortality [46].

Although the restoration of the first safe oral intake was not analysed in our study, previous research has shown interesting findings. A delayed restoration of the first oral intake in burn patients has been found in previous research. This delay was correlated with days of tracheostomy, length of mechanical ventilation, and % TBSA [9]. A previous study showed an extended period of supplementary nutrition in severe thermal burn patients with dysphagia before the achievement of exclusive oral intake [8]. These findings might represent an increase in hospital stay; which emphasizes the need for an early and appropriate management of swallowing.

Finally, dysphagia in the burn patient is a multifactorial condition related to medical management, orofacial compromise, and upper airway deficiencies. These alterations have a negative effect, not only on swallowing but also on facial mimicry, affecting communication. Therefore, it is important to notice that even in the absence of dysphagia, the SLP intervention in burn patients might be of benefit. The present study is the first approach in our country underlining the significance of the SLPs role in burn services. This study expected to contribute to the inclusion of SLPs as a crucial part of the team among national and international public policies and clinical guidelines. As discussed, previous research [8-11,15,41,47,48] has focused on the role of the SLP in the management of deglutition disorders, contributing to the reduction of associated risks for the burn patient.

The present study also provides the prevalence of dysphagia in a selected group of major burn patients; a population of considerably greater complexity compared to other health conditions with swallowing impairments.

As previously mentioned, specific clinical features (burn aetiology, % TBSA, inhalation injury, orofacial burns, and intubation, among others), as well as other variables such as the complexity of each centre, administrative and health management factors, and differences in the time considered for the execution of the study; are important for further analysis.

4.1. Limitations of the study, clinical interpretation, and future research

There are substantial limitations in the present study. The small sample size and the referred criteria may have affected the obtained prevalence rates representing a selection bias. There was a group of thirty patients that did not receive clinical swallowing assessment. Five of these individuals deceased and twenty-five did not meet the referral criteria to SLP. These might represent missed cases of dysphagia, especially those with discrete difficulties that benefit from an expert opinion for detection. Nevertheless, the presence of dysphagia in those twenty-five participants was unexpected, due to the continuous SLP monitoring of all hospitalized patients in our Burn Unit and the surveillance of the rest of the burn team care.

Additionally, a longer period for the execution of the study would allow us to increase the size of the sample. Representative data could be used for clinical purposes, or even enable an international multicentre collaborative trial.

Moreover, there are some non-controllable variables related to swallowing difficulties, such as the age of participants, anatomical variations (that can predispose patients to suffer mechanical damage during intubation), among others. As previously discussed, age increases the risk of developing dysphagia [42,43]. Given the above, elderly patients who present major burns become a group of special interest that might benefit from constant monitoring against the risk of swallowing impairment [32].

Another important limitation of the present study is the lack of consideration of reintubation periods, which can increase laryngeal damage and risk of dysphagia. The time between extubation and swallowing assessment was not considered either, which is a main factor that can generate bias in dysphagia diagnosis due to the presence of upper airway edema and respiratory state during evaluation.

Regarding procedures to determine the presence of dysphagia, a clinical assessment was performed by a trained SLP. This evaluation is subjective and depends on clinician experience and skills. Disparities in the selection criteria of certain procedures during a clinical swallowing assessment have been found among SLPs [49,50]. Therefore, future research should include a blind individual clinical evaluation of swallowing, carried out by more than one SLP, to ensure inter-rater reliability.

Moreover, an instrumental swallowing assessment was not included in this study. Interestingly, clinical experience does not necessarily affect decision-making in terms of using a complementary instrumental assessment [50]. Another study showed that SLP tend to perform clinical reasoning during the clinical assessment of swallowing instead of using a protocol with specific components [51]. Furthermore, a consistent result of abnormal deglutition between clinical assessment and modified barium study in thermally injured patients has been shown, exhibiting a predictive role of the bedside swallowing evaluation [38]. Instrumental assessment of swallowing might be included as a complementary diagnostic tool, to increase the objectivity and decrease the possibility of false-negative results in clinical swallowing examinations. Additionally, clinical evaluation methods involve an oral examination and functional performance using different food consistencies (including thin

liquids, pudding, puree, and soft solids) [38]. Although clinical practices performed in the present study are comparable to previous reports, the assessment of only two consistencies represents a limitation of our study.

Future research might include the use of standardized protocols for swallowing interventions to establish reference data for comparison purposes. On the other hand, the study of voice parameters in the burn patient and glottal function related to swallowing performance might also represent an interesting factor to analyse. We believe that the link between voice and deglutition is crucial from a functional perspective. One alternative might be measuring the impact of glottal deficiencies, such as valve function, in deglutition. The integrative role of SLP in the management of burn patients might also enable future research regarding relationships between other functional aspects in the burn population.

5. Conclusions

Dysphagia is a frequent adverse condition. The present study found a prevalence of 27.78% of dysphagia cases among all patients admitted to our National Burn Reference Centre in a 6-month period, varying in the degree of severity. Causes of this condition within burn patients include several factors, with the presence of orotracheal intubation being of great importance.

In this context, the involvement of professionals trained to address the nature and needs of the burn patient with dysphagia is essential. Therefore, the inclusion of the SLPs as a permanent member of the burn team is crucial, the goal of which is an early diagnosis and management of swallowing impairment. Such inclusion might contribute to the reduction of risks associated with dysphagia (respiratory-related complications, dehydration, and nutritional deficiencies) and the improvement of the rehabilitation of burn patients.

Conflict of interest

The authors have declared no conflict of interest.

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