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Correlation between scar assessment scales and orofacial myofunctional disorders in patients with head and neck burns

Correlação entre escalas de avaliação da cicatrização e as alterações miofuncionais orofaciais em pacientes com queimaduras de cabeça e pescoço

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Keywords

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ABSTRACT

Purpose: Verify the correlation between two scar assessment scales and the presence of orofacial myofunctional disorders (OMD) in patients with head and neck (H&N) burns. **Methods:** Participants of this study were 16 adult individuals with H&N full-thickness burns. Data were collected through assessment of mandibular range of movement and application of the following instruments: Patient and Observer Scar Assessment Scale (POSAS), Vancouver Scar Scale, and Orofacial Myofunctional Evaluation with Scores (OMES). **Results:** Results showed moderate negative correlation between the variables deglutition, breathing, total score of the functions, total score on the OMES and scores on the scar assessment scales, indicating that the higher (more severe) the scores on these scales, the lower the scores on the items of the OMES (indicative of greater OMD severity). No correlations were observed between the items of the OMES and the POSAS Patient scale. **Conclusion:** Results suggest that there is correlation between scar severity in burn patients, measured through clinical scales, and presence of OMD. Patients who present scores indicative of H&N pathological scars should be immediately referred to orofacial myofunctional assessment.

Descritores

Fonoaudiologia
Queimaduras
Pescoço
Cabeça
Cicatriz

RESUMO

Objetivo: Verificar a correlação entre duas escalas para avaliação das cicatrizes pós-queimaduras com as alterações miofuncionais orofaciais em pacientes queimados. **Método:** Participaram do estudo 16 adultos com sequelas de queimaduras de terceiro grau em cabeça e pescoço. As etapas de coleta de dados envolveram: aplicação das escalas de avaliação da cicatrização *Patient and Observer Scar Assessment Scales* (POSAS) e *Vancouver Scar Scale*, aplicação da Avaliação Miofuncional Orofacial com Escores Expandidos (AMIOFE-E) e avaliação da mobilidade mandibular. **Resultados:** Os resultados indicaram correlação negativa moderada entre os itens de deglutição, respiração, escore total de funções e escore total na AMIOFE-E e as escalas de cicatriz, indicando que, quanto mais grave a pontuação nessas escalas, menor a pontuação nos itens do AMIOFE-E (indicativo de maior alteração). Não foram observadas correlações entre os itens da avaliação clínica da motricidade orofacial e a escala de gravidade da cicatriz preenchida pelos pacientes. **Conclusão:** Os resultados do presente estudo sugerem que existe uma correlação entre a gravidade da cicatriz de pacientes queimados, medida por meio de escalas médicas, e as alterações miofuncionais orofaciais. Pacientes que apresentarem pontuação indicativa de cicatrizes patológicas em região de cabeça e pescoço devem ser imediatamente encaminhados para avaliação miofuncional orofacial.

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INTRODUCTION

Burns are acute injuries affecting the skin or other organ tissues. It is caused by external agents (thermal, electrical, chemical, or radioactive) that fully or partially destroy the epithelial tissue[1]. The severity and prognosis of burns are determined by the causative agent, the extension, depth and location of the burned area, the patient's age, pre-existing diseases, and associated lesions[2].

The World Health Organization (WHO)[3] considers burns a global public health issue, as it accounts for 180,000 deaths/year. Over one million burns are recorded every year in the United States; among these, five thousand are fatal. Statistics also show that approximately two thirds of burn injuries occur in African and Asian countries and that, overall, they tend to be more frequent in low-to-medium income countries[3]. In Brazil, the incidence rate of burns varies considerably in the literature, and normally refers to data from a single burn injury care center [*Centro de Tratamento de Queimaduras* – CTQ][4] Data from the Ministry of Health show that burns account for 2,000 deaths/year in Brazil, and the country's Unified Health System (SUS) spends approximately BRL 55 million a year in the treatment of these patients[5].

As for location of the burns, data available in the specific scientific literature on the incidence of burns to the head and neck (H&N) are limited. However, it is believed that approximately 50% of the cases of burns recorded worldwide affect these regions[6]. In addition to causing psychosocial disorders associated with face disfiguration, H&N burns may lead to orofacial myofunctional deficit, e.g., difficulty in eating and speaking caused by the lesion healing process[6]. According to the literature, even the most superficial skin injuries tend to leave some kind of scar[7]. Cicatrization is a dynamic physiological process influenced by a number of factors, such as infections, diabetes mellitus, hypothyroidism, coagulation disorders, vitamin deficiencies, age, severity of the trauma, etc[8].

There are few studies describing the devastating impact of burns on orofacial structures and their function. One of the main consequences resulting from the healing process of burns are keloids and hypertrophic scars caused by excess collagen in the lesion[9,10]. Hypertrophic scars are hard, thick, red, itchy, sensitive, and contracted[9]. The tractive forces caused by scar contracture may strain the skin and interfere with the extension movement of the neck, hinder lip occlusion, cause oral and maxillofacial deformities, and change the position of the trachea, which can put the life of the individual at risk, as it hampers intubation when necessary[11,12].

Severe face burns may also cause a deficit in lip sensitivity, hinder access to the mouth for oral and dental hygiene, restrain the movements of the mandible thus hindering mastication, cause adherence of the tongue to the floor of the mouth, and promote oral incompetence, in which the individual presents saliva leakage and difficulty in articulating speech sounds[13,14]. Microstomia resulting from scar contracture in the perioral region can hinder performance of daily activities, including swallowing[15]. Additionally, when scar contracture is not properly treated, it can cause skeletal deformities on the face at any age[12].

The literature presents several scales developed with the aim to evaluate the healing process in patients with burns, with the Vancouver Scar Scale and the Patient and Observer Scar Assessment Scale (POSAS) as the most widely used[16]. Scar assessment scales usually include variables that include color and size of the scar (appearance) as well as more subjective aspects, such as itching and/or pain[16]. Overall, these scales involve subjective scoring, and their application requires training[17]. Nevertheless, these scar assessment scales are still considered clinically supportive and are widely used to assess the outcomes of surgical intervention and other therapies used for the sequelae resulting from the healing processes.

Considering that physicians are the professionals responsible for the referral of burn patients to orofacial myofunctional rehabilitation, this study aimed to verify the correlation between two scar assessment scales commonly used by physicians and the presence of OMD in patients with H&N burns.

METHODS

This observational prospective cross-sectional study was approved by the Research Ethics Committee of *Hospital das Clínicas* of *Faculdade de Medicina da Universidade de São Paulo* (HCFMUSP–CAPPesq) under protocol no. 1.455.644. All patients or legal guardians signed an Informed Consent Form (ICF) prior to study commencement.

Study sample

Study participants were 16 individuals with full-thickness burn sequelae in the H&N: 10 women and six men aged 18-54 years (mean 36.6±18.3) referred to the Speech-language Pathology Department of the *Hospital das Clínicas* of *Faculdade de Medicina da Universidade de São Paulo* (HCFMUSP) from April 2017 to April 2018 for assessment and rehabilitation. The total body surface area (TBSA) burned varied between 6 and 44% according to the medical records, which indicated a minimum period of one year between burn and speech-language pathology (SLP) therapy, in addition to the surgical procedures employed for treatment of the scars. The time elapsed between the last surgical procedure and SLP evaluation for all patients ranged from one to three months.

Scar assessment

Scar assessment for each patient was conducted in partnership with the team of the Plastic Surgery Department of HCFMUSP at the Burn Sequelae Outpatient Clinic [*Ambulatório de Sequelas de Queimaduras*] on the same day of the SLP evaluation, when the scar assessment scales were applied by the physician in charge of the case. The following scales were used:

Patient and Observer Scar Assessment Scale (POSAS)[17]

This assessment is composed of two sub-scales: one aimed at the observer (examiner) and one at the patient. All items of both scales must be rated from 1 to 10. The higher the final

score in each item assessed, the worse the condition of the scar. In the POSAS-Observer scale, 1 corresponds to "like normal skin" and 10 represents "worst scar imaginable", whereas in the Patient sub-scale, 1 corresponds to "as normal skin" and 10 means "very different" in response to the question: "What is your overall opinion of the scar compared to normal skin?"; minimum and maximum scores in response to the specific item questions are described ahead.

The parameters assessed by the observer with regard to the scar are as follows: vascularity – presence of vessels in the scar tissue assessed according to capillary filling, and the predominant color must be considered (pale, pink, red, purple, or mix); pigmentation – brownish coloration of the scar by pigment (melanin) (hypo, hyper, or mix); thickness – average distance between the subcutical-dermal border and the epidermal surface of the scar (thicker or thinner); relief – the extent to which surface irregularities are present, preferably compared with adjacent normal skin (more, less, or mix); pliability – suppleness of the scar tested by wrinkling it between the thumb and index finger (supple, stiff, or mix); surface area – surface area of the scar in relation to the original wound area (expansion, contraction, or mix).

The items assessed by the patient with regard to the scar are based on the following questions: Has the scar been painful the past few weeks? and Has the scar been itching the past few weeks?, Is the scar color different from the color of your normal skin at present?, Is the stiffness of the scar different from your normal skin at present?, Is the thickness of the scar different from your normal skin at present?, and Is the scar more irregular than your normal skin at present?

Vancouver Scar Scale[18]

This scale has been developed and validated to assess the functional and aesthetic aspect of the scar. The scale analyzes the characteristics of pigmentation, vascularity, pliability, and height of the scar. The final score varies between 0 and 13, with the lower the score, the better the scar. The characteristics of the protocol are assessed as follows: pigmentation – (0) normal, (1) hypopigmentation, and (2) hyperpigmentation; vascularity – (0) normal, with color similar to the rest of the body, (1) pink, (2) red, and (3) purple; pliability – (0) normal, (1) supple - flexible to minimum resistance, (2) yielding -giving away to pressure, (3) firm - inflexible, not easily moved, resistant to manual pressure; (4) banding - rope-like tissue that blanches with extension of scar, (5) contracture - permanent shortening to the scar producing deformity or distortion; height – (0) normal - flat, (1) <2 mm, (2) ≥2 and <5 mm, (3) >5 mm.

Orofacial myofunctional evaluation

All participants were submitted to clinical orofacial myofunctional assessment using the Expanded Orofacial Myofunctional Evaluation with Scores (OMES-E) protocol[19]. This protocol aims to evaluate the components of the stomatognathic system (lips, tongue, mandible, and cheeks) with respect to their structures and functions according to the following categories: posture/appearance, mobility, breathing, deglutition and mastication. The data observed were converted into a numerical scale, where the maximum possible score for each individual is 230. Data collection was carried out by means of visual inspection during the evaluation and, subsequently, by analysis of the photographic and footage records using a digital camera (Sony DSC – W120).

In order to guarantee the reliability of the outcomes of the clinical evaluation, all participants were evaluated by two independent speech-language therapists with experience in the field. The Kappa Coefficient was used to verify the agreement between the examiners for the total OMES-E score, and the result showed a high level of agreement (0.86).

Evaluation of mandibular range of movement

A methodology based on the literature was used for the evaluation of mandible amplitude[20]. The following measures were taken using a digital caliper (Digimess Pró-Fono, Pró-Fono Produtos Especializados para Fonoaudiologia Ltda., Brazil):

1) Maximal incisor opening – Distance between the incisal ridges of the maxillary and mandibular central incisors, in addition to the measure of vertical overlap;
2) Mandibular lateralization – horizontal distance from the mandibular central incisor to the maxillary central incisor after asking the individual to glide their mandible to the right and, subsequently, to the left; when midline deviation was present, appropriate adjustment was made;
3) Mandibular protrusion – sum of the measures of the horizontal overlap and the maximum horizontal mandibular gliding;
4) Midline deviation – if the lines between the central incisors did not coincide, corrective measure was undertaken horizontally between the distal surfaces.

Data analysis

The data collected were submitted to statistical analysis using the SPSS 25 software. For the quantitative variables, descriptive analyses were conducted for the mean, standard deviation, median, minimum and maximum values, whereas for the qualitative variables, descriptive analyses of total counts and percentages were carried out. Association between the variables was also investigated using the Spearman's correlation coefficient. The level of significance adopted was 5%, and the correlation coefficient obtained was interpreted based on the following criteria: $r<-0.750$ – strong negative correlation; $-0.750<r<-0.500$ – moderate negative correlation; $-0.500<r<-0.250$ – weak negative correlation; $-0.250<r<0.250$ – no correlation; $0.250<r<0.500$ – weak positive correlation; $0.500<r<0.750$ – moderate positive correlation; $r>0.750$ – strong positive correlation.

RESULTS

Of the total study sample (n=16), 14 patients presented burns in the H&N region and two patients had burns only in the head region. For most individuals (n=14), the causative agent of the burns was thermal (electrical for one patient and chemical for another), and all patients had undergone at least two surgical procedures for treatment of scar sequelae (debridement and grafting in seven patients; debridement, grafting and commissuroplasty in six; debridement, grafting and release of cervical retraction in two; debridement, grafting and skin expansion in one patient). All patients presented hypertrophic scars.

Table 1 presents a descriptive summary of the results found in the POSAS assessment. In the POSAS Patient scale, the items with lower scores were stiffness and irregularity of the scar, whereas in the POSAS Observer scale, the items with lower scores were pliability, and thickness of the scar and overall opinion.

Table 2 shows a descriptive summary of the results found in the Vancouver Scar Scale. According to this scale, most participants presented scars with the following characteristics: pigmentation - hyperpigmentation, vascularity - pink, pliability - contracture, and height - <2 mm.

Table 3 presents a descriptive summary of the results found in the OMES-E evaluation. The normality values in this test are found on the right-side column. It was observed that the research participants did not reach the values expected - the mobility and mastication function of the orofacial organs deviated more than expected from the maximum score for the OMES-E items.

As for the evaluation of mandibular amplitude, the normality measures found in the literature were used for comparison[21]. The results found in the patients were: maximal incisor opening – 37.9±5.9 mm (normality between 40 and 60 mm); mandibular lateralization to the right – 6.9±3.6 (normality between 7 and 11 mm); mandibular lateralization to the left – 7.7±3.7 (normality between 7 and 11 mm); mandibular protrusion – 6.8±1.8 (normality between 7 and 11 mm). It can be observed that only the maximal incisor opening measure deviated from the normality standards.

Table 4 shows the results of the analysis of association between the POSAS assessment scale and the other variables, i.e., sample characterization variables, Vancouver Scale score, OMES-E protocol, and evaluation of mandibular range of movement. The result of Spearman's correlation test showed significant negative correlation between the total score obtained with the POSAS Observer scale and the variables mastication, total score of the functions, and total score of the OMES-E, in which moderate correlation was observed for the three variables.

Table 5 presents the result of the analysis of association between the Vancouver Scar Scale and the other variables, that is, sample characterization and results of the POSAS scale, OMES-E protocol, and evaluation of mandibular range of movement. The Spearman's correlation test results indicated significant negative correlation between the total score in the Vancouver Scar Scale and the variables breathing and deglutition, total score of the functions, total score of the OMES-E, and left lateralization in the evaluation of mandibular range of movement, in which moderate correlation was verified for the four variables.

Table 1. Descriptive summary of the Patient and Observer Scar Assessment Scale (POSAS) results (n=16)

POSAS Scale		Mean (±standard deviation)
POSAS Patient Scale	Pain	3.3 (2.9)
	Itching	4.1 (3.2)
	Color	6.3 (3.6)
	Stiffness	7.1 (3.1)
	Thickness	5.9 (3.6)
	Irregularity	6.8 (3.3)
	Overall opinion	6.6 (2.9)
	Total	40.0 (18.4)
POSAS Observer Scale	Vascularity	6.4 (2.5)
	Pigmentation	6.8 (2.1)
	Thickness	7.1 (2.0)
	Relief	6.8 (1.8)
	Pliability	7.5 (2.0)
	Surface area	6.9 (1.7)
	Overall opinion	7.4 (1.8)
	Total	48.9 (12.3)

Table 2. Descriptive summary of the Vancouver Scar Scale results (n=16)

Vancouver Scar Scale		Number of participants (percentage)
Pigmentation	Normal	0 (0.0%)
	Hypopigmentation	7 (43.8%)
	Hyperpigmentation	9 (56.3%)
Vascularity	Normal	0 (0.0%)
	Pink	10 (62.5%)
	Red	5 (31.3%)
	Purple	1 (6.3%)
Pliability	Normal	0 (0.0%)
	Supple	1 (6.3%)
	Yielding	3 (18.8%)
	Firm	2 (12.5%)
	Ropes	3 (18.8%)
	Contracture	7 (73.8%)
Height	Flat	4 (25.0%)
	<2 mm	7 (43.8%)
	≥2 to ≤5 mm	4 (25.0%)
	>5 mm	1 (6.3%)
		Mean (±standard deviation)
Total		9.9 (2.1)

Table 3. Descriptive summary of the Expanded Orofacial Myofunctional Evaluation with Scores (OMES-E) protocol results (n=16)

OMES-E		Mean (±standard deviation)	Normality
Appearance and posture	Face	8.6 (1.6)	12
	Cheek appearance	6.1 (1.4)	8
	Mandible/Maxilla relation	9.3 (2.8)	12
	Lips	8.7 (±1.9)	12
	Mentalis muscle	3.3 (1.1)	4
	Tongue	5.7 (±1.7)	8
	Palate appearance	5.8 (1.9)	8
	Total	47.4 (7.8)	64
Mobility	Lips	15.3 (3.7)	24
	Tongue	23.4 (7.6)	36
	Mandible	21.6 (4.3)	30
	Cheeks	17.1 (5.7)	24
	Total	77.4 (13.2)	114
Breathing		3.5 (0.7)	4
Deglutition	Lips behavior	4.2 (1.6)	6
	Tongue behavior	3.3 (1.1)	4
	Other behaviors and change signs	9.8 (1.8)	12
	Efficiency	4.6 (1.1)	6
	Total	21.8 (±4.2)	28
Mastication	Bite	3.2 (1.2)	4
	Preferred side	5.1 (2.3)	10
	Other behaviors and change signs	5.3 (1.0)	6
	Total	13.6 (3.1)	20
Total score – Functions		38.8 (6.8)	52
TOTAL		163.6 (23.4)	230

Table 4. Association between the POSAS scale and the other variables, i.e., sample characterization, Vancouver Scale, OMES-E protocol, and evaluation of mandibular range of movement

		Association with the POSAS scale			
		POSAS Patient Scale (total)		POSAS Observer Scale (total)	
		r	*p*-value	*r*	*p*-value
Age		0.026	0.924	-0.210	0.434
Gender		0.154	0.569	0.183	0.499
Percentage of Total Body Surface Area (%TBSA) burned		-0.032	0.905	-0.074	0.786
Burn causative agent		-0.189	0.483	-0.456	0.076
Type of surgery		0.420	0.105	0.102	0.708
Burned area		-0.205	0.446	0.411	0.114
Vancouver Scar Scale – Total		0.429	0.097	0.471	0.066
OMES-E	Appearance posture – Total	0.069	0.799	-0.459	0.074
	Mobility – Total	-0.007	0.981	-0.457	0.075
	Breathing – Total	0.096	0.724	-0.142	0.599
	Deglutition – Total	0.082	0.762	*-0.549*	*0.028**
	Mastication – Total	-0.049	0.857	-0.481	0.060
	Functions – Total	0.032	0.905	*-0.560*	*0.024**
	OMES-E – Total	0.034	0.901	*-0.633*	*0.009**
Mandibular range of movement	Maximal incisor opening	0.109	0.688	-0.122	0.652
	Lateralization to the right	-0.001	0.996	0.062	0.820
	Lateralization to the left	-0.071	0.795	-0.124	0.648
	Protrusion	-0.178	0.509	-0.139	0.609

*Statistically significant difference according to the Spearman's correlation coefficient

Table 5. Association between the Vancouver Scar Scale and the other variables, i.e., sample characterization, POSAS scale, OMES-E protocol, and evaluation of mandibular range of movement

		Association with the Vancouver Scar Scale	
		r	p-value
Age		-0.077	0.777
Gender		-0.142	0.599
Percentage of Total Body Surface Area (%TBSA) burned		-0.286	0.283
Burn causative agent		0.034	0.901
Type of surgery		-0.001	0.998
Burned area		0.313	0.239
POSAS Scale	Patient	0.429	0.097
	Observer	0.471	0.066
OMES-E	Appearance and posture – Total	-0.145	0.591
	Mobility – Total	-0.223	0.406
	Breathing – Total	*-0.509*	*0.044**
	Deglutition – Total	*-0.545*	*0.029**
	Mastication – Total	-0.337	0.202
	Functions – Total	*-0.512*	*0.043**
	OMES-E – Total	-0.323	0.223
Mandibular range of movement	Maximal incisor opening	0.058	0.830
	Lateralization to the right	-0.209	0.437
	Lateralization to the left	*-0.508*	*0.044**
	Protrusion	-0.123	0.651

*Statistically significant difference according to Spearman's correlation coefficient

DISCUSSION

This is the first study correlating orofacial myofunctional disorders (OMD) observed in patients with burns in the head and neck (H&N) region conducted with the most widely used clinical scar assessment scales. Overall, the results showed negative correlation between the deglutition and breathing items, and total OMES-E score, and the scar scales, which indicates that the higher (more severe) the scores in these scales, the lower the scores on the OMES-E items (indicative of greater OMD severity). No correlations were observed between the OMES-E items and severity of the POSAS Patient scale.

These results corroborate the data found in the literature, which show that contracture caused by hypertrophic scars have a negative impact on the orofacial myofunctional system[14,15,22]. Scar healing is a sensitive process controlled by the organism, and involves both cells and chemical mediators. Errors in this process may cause the emergence of pathological scars, such as hypertrophic scars, which ultimately cause contracture[23]. Hypertrophic scars are typically red or pink, often itchy, thick, and circumscribed within the limits of the original injury[23]. The first symptoms appear after a few weeks. In this process, three classical phases are observed: proliferative phase with rapid increase in the scar size, static phase, and regression period; however, the maturing process of these scars may take years[23]. Contracture is an active biological process in which the injured area reduces, resulting in smaller deposit of connective tissue and reduction in the reepithelization process[24]. Wound contracture involves interaction between fibroblasts, myofibroblasts, and collagen deposition, and tends not to leave sequelae only in places with less tissue loss and non-critical areas.

The results of this study can be justified by the limited incisor opening and insufficient lip closure, which hinder orofacial functions[25]. Although no correlation was observed between mandibular range of movement measures and scar severity, the results showed that the patients included in this study presented limited incisor opening. Mandibular movement requires adaptation to a wide range of factors associated with the orofacial myofunctional system[20]. According to the literature, mandibular movements cause changes in the buccal space, influencing mastication, deglutition, and speech, as they enable proper movement of the tongue and other soft tissues in the oral cavity[26]. The maximal incisor opening measurement is traditionally used to assess the temporomandibular joint (TMJ) function[21]. Therefore, mandibular movements reflect proper functioning of the TMJ.

The literature points out that, even when individuals are functionally and/or structurally limited, orofacial functions can be performed by means of adaptations that usually go unnoticed to them[21]. These adaptations can be muscular or structural, and often impose restrictions on muscle function, which may, in turn, have an impact on mandibular movements[27]. It is known that prolonged limitation in muscle activity may trigger future structural deficits such as atrophy, with reduction in muscle force, which may further limit mandibular movements and cause permanent structural changes to the TMJ[27]. Therefore, preventing these adaptations from occurring is essential for patients with post-burn healing sequelae.

In this study, no correlation was found between the POSAS Patient scale and presence of OMD. Patients' self-assessment provides information regarding their quality of life. According to the literature, this is important for a better understanding of the physical, psychological and social impacts on burn victims, as well as for discussion about potential interventions and treatments[28,29]. Nevertheless, this type of assessment is widely discussed, as patients do not present established theoretical and technical grounds to fill out these scales, thus they end up responding to the questions according to their feelings at that particular moment[25,30].

Finally, this study presents some limitations. The sample included patients from a single institution; therefore, the results should not be generalized, as they originate from specific procedures adopted at that institution. The participants were heterogeneous and presented different TBSAs, in addition to having undergone different surgical procedures. Furthermore, the OMES-E clinical protocol was not developed to evaluate burn patients, but to investigate primary OMD. For this reason, evaluation parameters specific to burn injuries associated with orofacial functions, such as the amount of soft tissue lost and the specific location of the scar, were not included[14]. Further studies should be conducted with larger samples and longitudinal follow-up aiming at a better understanding of the impact of H&N burns on OMD.

CONCLUSION

The results of this study suggest that there is correlation between scar severity in burn patients, measured through medical scales, and presence of orofacial myofunctional disorders (OMD). Patients who present scores indicative of head and neck (H&N) pathological scars should be immediately referred to orofacial myofunctional evaluation.

REFERENCES

1. Burd A. Burns: treatment and outcomes. Semin Plast Surg. 2010;24(3):262-80. http://dx.doi.org/10.1055/s-0030-1263068. PMid:22550448.
2. Rowan MP, Cancio LC, Elster EA, Burmeister DM, Rose LF, Natesan S, et al. Burn wound healing and treatment: review and advancements. Crit Care. 2015;19(1):243. http://dx.doi.org/10.1186/s13054-015-0961-2. PMid:26067660.
3. WHO: World Health Organization. Burns [Internet]. Switzerland: WHO; 2018 [citado em 2017 Mar 27]. Disponível em: www.who.int/mediacentre/factsheets/fs365/en/
4. Cruz BF, Cordovil PBL, Batista KNM. Epidemiological profile of patients who suffered burns in Brasil: literature review. Rev Bras Queimaduras. 2012;11(4):246-50.
5. Brasil. Ministério da Saúde. Departamento de Informática do SUS. Informações de Saúde. Epidemiológicas e morbidades: internações segundo região [Internet]. Brasília: DATASUS; 2014 [citado em 2017 Mar 27]. Disponível em: http://www2.datasus.gov.br/DATASUS/index.php/index.php?area=0203
6. Hamilton TJ, Patterson J, Williams RY, Ingram WL, Hodge JS, Abramowicz S. Management of head and neck burns: a 15 year review. J Oral Maxillofac Surg. 2018;76(2):375-9. http://dx.doi.org/10.1016/j.joms.2017.09.001. PMid:28963867.
7. Gankande TU, Wood FM, Edgar DW, Duke JM, DeJong HM, Henderson AE, et al. A modified Vancouver Scar Scale linked with TBSA (mVSS-TBSA): inter-rater reliability of an innovative burn scar assessment method. Burns. 2013;39(6):1142-9. http://dx.doi.org/10.1016/j.burns.2013.01.014. PMid:23433706.
8. Campos ACL, Borges-Branco A, Groth A. Cicatrização de feridas. ABCD Arq Bras Cir Dig. 2007;20(1):51-8. http://dx.doi.org/10.1590/S0102-67202007000100010.
9. Wang XQ, Kravchuk O, Winterford C, Kimble RM. The correlation of in vivo burn scar contraction with the level of smooth muscle action expression. Bruns. 2011;37(8):1367-77. PMid:21855218.
10. Ogowa R. Keloid and hypertrophic scars are the result of chronic inflammation in the reticular dermis. Int J Mol Sci. 2017;18(3):606-16. http://dx.doi.org/10.3390/ijms18030606. PMid:28287424.
11. Makboul M, El-Oteify M. Classification of post-burn contracture neck. Indian Journal of Burns. 2013;21(1):50-4. http://dx.doi.org/10.4103/0971-653X.121883.
12. Güven E, Ugurlu AM, Hocaoglu E, Kuvat SV, Elbey H. Treatment of post-burn upper extremity neck and facial contractures: reporto f 77 cases. Ulus Travma Acil Cerrahi Derg. 2010;16(5):401-6. PMid:21038116.
13. Mordjikian E. Severe microstomia due to burn by caustic soda. Burns. 2002;28(8):802-5. PMid:12464482.
14. Clayton NA, Ledgard JP, Haertsch PA, Kennedy PJ, Maitz PKM. Rehabilitation of speech and swallowing after burns reconstructive surgery of the lips and nose. J Burn Care Res. 2009;30(6):1039-45. http://dx.doi.org/10.1097/BCR.0b013e3181bfb907. PMid:19826257.
15. Wust KJ. A modified dyamic mouth splint for burns patients. J Burn Care Res. 2006;27(1):86-92. http://dx.doi.org/10.1097/01.bcr.0000192267.55348.dd. PMid:16566541.
16. Brusselaers N, Pirayesh A, Hoeksema H, Verbelen J, Blot S, Monstrey S. Burn scar assessment: a systematic review of objective scar assessment tools. Burns. 2010;36(8):1157-64. http://dx.doi.org/10.1016/j.burns.2010.03.016. PMid:20488623.
17. Linhares CB, Viaro MSS, Collares MVM. Tradução para o português da Patient and Observer Scar Assessment Scale (POSAS). Rev Bras Cir Plást. 2016;31:95-100.
18. Santos MC, Tibola J, Marques CMG. Traduação, revalidação e confiabilidade de Cicatrização de Vancouver para língua portuguesa – Brasil. Rev Bras Queimaduras. 2014;13:26-30.
19. Felício CM, Folha GA, Ferreira CL, Medeiros AP. Expanded protocol of orofacial myofunctional evaluation with scores: validity and reability. Int J Pediatr Otorhinolaryngol. 2010;74(11):1230-9. http://dx.doi.org/10.1016/j.ijporl.2010.07.021. PMid:20800294.
20. Felício CM, Trawitzki LVV. Interfaces da medicina, odontologia e fonoaudiologia no complexo cérvico-craniofacial. 1. ed. Barueri: Pró-Fono; 2009.
21. Johnson DL, Brand JW, Young SK, Duncanson MG Jr. Adaptation of the temporomandibular joint to altered mandibular function. Int J Prosthodont. 1995;8(5):445-55. PMid:8595102.
22. Rumbach AF, Ward EC, Cornwell PL, Bassett LV, Muller MJ. The challenges of dysphagia management and rehabilitation after extensive thermal burn injury: a complex case. J Burn Care Res. 2009;30(5):901-5. http://dx.doi.org/10.1097/BCR.0b013e3181b487e0. PMid:19692928.
23. Bran GM, Goessler UR, Hormann K, Riedel F, Sadick H. Keloids: current concepts of pathogenesis (review). Int J Mol Med. 2009;24(3):283-93. http://dx.doi.org/10.3892/ijmm_00000231. PMid:19639219.
24. Goel A, Shrivastava P. Post-burn scars and contractures. Indian J Plast Surg. 2010;43(3, Supl Supl):S63-71. http://dx.doi.org/10.4103/0970-0358.70724. PMid:21321660.
25. Clayton NA, Ward EC, Maitz PK. Intensive swallowing and orofacial contracture rehabilitation after severe burn: a pilot study and literature review. Burns. 2017;43(1):e7-17. http://dx.doi.org/10.1016/j.burns.2016.07.006. PMid:27575671.
26. Bianchini EM, Paiva G, Andrade. Mandibular movement patterns during speech in subjects with temporomandibular disorders and in asymptomatic individuals. Cranio. 2008;26(1):50-8. http://dx.doi.org/10.1179/crn.2008.007. PMid:18290525.
27. Greene CS. Managing the care of patients with temporomandibular disorders: a new guideline for care. J Am Dent Assoc. 2010;141(9):1086-8. http://dx.doi.org/10.14219/jada.archive.2010.0337. PMid:20807907.
28. Unsworth CA, Duckett SJ, Duncombe D, Perry A, Skeat J, Taylor N. Validity of the AusTOM scales: a comparison of the AusTOMs and EuroQol-5D. Health Qual Life Outcomes. 2004;2(1):64. http://dx.doi.org/10.1186/1477-7525-2-64. PMid:15541181.
29. Ahuja RB, Mulay AM, Ahuja A. Assessment of quality of life (Qol) of burn patients in India using BSHS-RBA scale. Burns. 2016;42(3):639-47. http://dx.doi.org/10.1016/j.burns.2015.11.011. PMid:26796242.
30. Parlak Gürol A, Polat S, Akçay MN. Itching, pain, and anxiety level are reduce with massage therapy in burned adolescents. J Burn Care Res. 2010;31(3):429-32. http://dx.doi.org/10.1097/BCR.0b013e3181db522c. PMid:20453734.

Author contributions

DMM and LPMV data collection and analysis, writing and proofreading of the manuscript; FCS data analysis, writing and proofreading of the final version of the manuscript; CRFA project design, writing and proofreading of the final version of the manuscript.