

Case reports

Orofacial motricity and use of mixed techniques in a cranio-facial trauma: a case report

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Conflict of interests: Nonexistent



ABSTRACT

No reports about treatments applied by orofacial motricity experts, in craniofacial trauma, were found in the specialized literature. However, their knowledge, added to that of the aesthetic area, would be useful in the rehabilitation of scars. The aim of this work is to describe the mixed use of orofacial motor skills, muscle balance massage and scar management in a patient with soft tissues facial trauma. During the initial evaluation, a decrease in the vertical and horizontal oral opening and in the mimic movements, facial asymmetry and marked scars that affected the oral phase of swallowing, chewing (bolus formation), lip mobility, compromising speech intelligibility and, significantly, aesthetics, were observed. Myofunctional therapy lasted 12 months, during which the patient underwent three surgeries. The process was divided into an intensive phase (six months, two weekly sessions) and a follow-up phase (six months, one weekly session), which ended when the indicators evaluated at the beginning were stable, showing improvements in scars condition and appearance, as well as in orofacial functions, including pre-post therapy self-perception and greater muscular mobility, reflecting a management with an integrative approach.

Keywords: Massage; Facial Injuries; Procedures and Techniques Utilization; Myofunctional Therapy; Esthetics

Received on: February 1, 2021

Accepted on: March 25, 2021

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INTRODUCTION

The Cranio-Cervical-Mandibular Complex (CCMC), formed by the maxilla and lower jaw, the teeth, the temporomandibular joint and all their associated muscles, is an essential functional unit for life¹. A trauma in some of its structures can be lethal or bring on important and permanent or long-term visual², functional³ and aesthetic sequels⁴; it can also affect the airways, the intracranial structures or produce haemorrhages⁵. Specifically, the Cranio Facial Traumas (CFT) are high probability injuries that may occur at any age, sex, race or social class⁴. A CFT (accidents being its main cause) can affect the whole CCMC, damaging dentoalveolar structures and soft and bone tissues⁶. Early therapy is essential in these cases, to reduce morbidity and mortality, also avoiding later complex reconstructions⁷. When the injury is too deep and damages the dermis, this process becomes even more complex, increases recovery times and shows undesirable sequel possibilities such as scars⁸. The latter appear as fibrous tissues: their texture and elasticity are different from those of healthy tissues. Wound healing presents stages such as inflammatory, epithelial, fibro-plastic and remodeling ones⁴. Once established, scars can evolve negatively, producing atrophy, hypertrophy, retraction, adhesences and pigmentation changes⁴.

Hypertrophic scars display diverse associated symptoms: pain, itching and a feeling of oppression⁹. Up to 86% of persons with this kind of scars mention suffering from some of these symptoms, besides loss of self-esteem, depression symptoms and stigmatization; repercussions linked to the associated unsightly aesthetics¹⁰.

The therapeutic approach to pathologic scars is directed to manipulation of the injured mechanical properties, correction of the abnormal collagen synthesis balance and modulation of the inflammatory response¹⁰. In these cases, the progress of reconstructive and post-operation surgery science has changed from an approach centered in medical-surgery treatments to a more integrative one, where kinesiology and occupational therapy contributions were incorporated, using techniques such as hydrotherapy, mobilizations, use of ferules and application of compressive therapy, among others⁴.

Among the myofunctional disorders derived from a CFT are those associated to orofacial functions such as swallowing, where, depending on the degree of severity, one or more stages could be affected, among

them the pre-oral stage, essentially, the moment of the transfer of the food from the utensil to the mouth. Besides, this may affect bolus formation and the oropharyngeal motor response. Specifically, as regards chewing, disorders at the mobility level, opening and laterality are reported¹¹. Speech is another compromised aspect, as a result of the structural limitations or restrictions in the damaged area, that can generate modifications at the point and mode of articulation in the production of phonemes¹².

The contribution of speech therapy in patients with CFT and scars has been traditionally associated to the treatment of swallowing and communication (voice and speech). In this sense, available scientific communications about scars, scarcely approach their management from an orofacial motricity (MO) point of view, or from the aesthetic view and it is even less frequent to use an integrative approach. The latter takes into account function and structure as interrelated aspects, that is to say integrated. In other words, it is assumed that when a function is approached, this positively affects the structures, which speaks about the reciprocity between form and function, effects working back and forth. Furthermore, an interdisciplinary approach is promoted, as opposed to the traditional working pattern, which is fragmented, with isolated interventions of the professionals¹¹.

The purpose of this work is to describe the mixed use of orofacial motricity techniques, muscle balance massage and scars management in a patient who suffered a facial trauma in his soft tissues.

CASE REPORT

This study was conducted according to the Helsinki Declaration and approved by the accredited Scientific Ethics Committee, Aconcagua Health Service, Region of Valparaíso, Chile (CEC-SSA 04/2019, CI-N°106). The Informed Consent Form was signed freely and voluntarily by the patient, accepting that his information was to be used for scientific and academic purposes, safeguarding personal and sensitive data.

Patient: a 56 year-old man, admitted in 2016 to the emergency service of the provincial hospital of his domicile. A facial trauma in his soft tissues -due to a domestic accident with a power saw- was diagnosed; it involved the middle and lower asymmetric third of the face, with greater slant to the left and trauma in 8 dental pieces: A total loss (of the first upper right pre-molar) and seven partial losses (upper right canine; second upper left molar; first lower left incisor; second lower

left incisors: lower left canine; first lower left premolar and second lower left premolar). He was admitted to the intensive care unit of the hospital and primary closing surgery was done the first day (Figure 1).



Figure 1. Condition of the patient's wounds after primary closing surgery time

Initial reconstructive surgery took place on the third day. Later on, the patient remained hospitalized for fifteen days and then was discharged from the hospital: the use of a silicone mask was indicated, to start the rehabilitation procedure. The patient was reluctant to use the mask, saying that he used it for one night and discarded it. Concerning rehabilitation, this began with ultrasound kinesiology sessions during one month, in parallel with the first phonaudiology sessions detailed below. The patient mentioned that his physician indicated the use of sunscreen, hat, and avoid exposure to the sun. Furthermore, he underwent repair surgery on the seventh month after discharge.

Speech Therapy assessment

The patient was seen four weeks after the accident. TCM is observed on the soft tissues, having scabs; the direction of the cut starts on the right quadrant upper lip and goes down to the lower lip, then, there was an ascending turn to the left commissure, ending in the left cheek. There being no protocol to allow assessing all the aspects related to this TCM, especially the scars, this was done as follows: the assessment took into account four general clinical aspects, with their specific aspects: orofacial motricity, anthropometric measurements, facial mimic and condition of the scars¹². For the

first two aspects, the items of the Orofacial Myofunction Assessment Protocol – MBGR were used as guide¹³. The points were not used for the assessment of this case: a qualitative appreciation was prepared, detailed and adjusted to the patient, as regards the compromised functions and structures. The *Clinical Score for Facial Mimic Protocol*¹⁴, was used to assess facial mimic. This assesses facial functional/cosmetic aspects and mobility. The fourth aspect, condition of the scars was measured using the *Vancouver Scar Scale* (VSS), which assesses the pigmentation, vascularity, flexibility and thickness¹⁵.

An initial assessment took place when the patient was medically stable, and was repeated three times during the attention period, that is at the beginning, at 6 months and 12 months (end of the therapy). The intermediate attention (6th month) was performed before repair surgery. The therapy started by a diagnosis of orofacial Miofunctional disorder, secondary to CFT. The therapy contemplated the mixed use of MO¹² techniques, muscle balance massage and scars management¹⁰ with an integrative approach¹¹.

The face harmony condition was observed in **orofacial motricity** as slight, moderate or severe asymmetry. Facial sensitivity, detected by means of the response to digital touch, was classified as preserved or compromised, palpating intraoral zones (soft and hard palate, cheeks, vestibule, tongue and lip mucosa) and extra oral (lips, upper and lower outer peri-buccal area, chin and cheeks). Pain on palpation was verified at the intra and extra oral level, in the same areas as before, asking the patient to state the degree of pain in a subjective scale of 0 to 10, where zero represents the absence of pain and 10 to unbearable pain. The assessment of the damage to the lip, cheek and chin consisted in identifying the degree of trophism (eutrophy, hypotrophy and hypertrophy) and the dental pieces condition.

Orofacial functions were also assessed here, observing aspects of speech, chewing and swallowing, detailed in Table 1. Regarding chewing and swallowing, the same solid food was used (bread), while the transference of food was assessed using a liquid (yogurt), during the three assessment instances. Spontaneous speech was assessed (tell age, Name, date of birth, and a short speech), automatic (months of the year, days of the week and numbers 1-20) and naming figures (pictures of common objects).

Table 1. Condition of the orofacial functions at the three assessment times

FUNCTION/ PROCESS	ASSESSMENT TIMING / CONDITION OF THE PROCESS		
	Initial	6 months	12 months
CHEWING			
1. Incision	Lateral	Lateral	Anterior
2. Grinding	Front Teeth	Front Teeth	Back Teeth
3. Pattern	Bilateral simultaneous	Unilateral preferential	Bilateral alternate
4. Lips closure	Systematic augmented	Systematic	Systematic
5. Speed	Diminished	Adequate	Adequate
SWALLOWING			
1. Lips posture	Closed	Closed	Closed
2. Tongue posture	Non Observable	Non Observable	Non Observable
3. Contraction O-B	Slight	Adequate	Adequate
4. Transference	Altered	Adequate	Adequate
5. Residues	Present	Adequate	Adequate
SPEECH			
1. Spontaneous	Distorted	Adequate	Adequate
2. Automatic	Distorted	Adequate	Adequate
3. Nomination	Distorted	Adequate	Adequate
4. Intelligibility	Imprecise	Adequate	Adequate
5. Oral opening	Reduced	Adequate	Adequate
6. Lips mobility	Reduced	Adequate	Adequate

Anthropometric measurements were carried out, using a digital caliper, to measure (in millimeters) the maximum vertical and horizontal oral opening. For MO, the usual procedure is to measure the vertical oral opening, but the horizontal measurement was added in this case due to the nature of the cut¹². The distance between the lower and upper central incisors was measured in the vertical plane and for the horizontal opening the distance between lip commissures, both in static opening. The normal range of a maximum vertical opening for adults is 35 to 40 mm^{11,12,16,17}. Concerning the horizontal plane, no publications with reference measurements were found. It was considered relevant to consign the measurement in this case, given the great rigidity of the affected area.

The *Clinical Score for Facial Mimic Protocol* was used to assess facial mimic¹⁴. This protocol assesses the facial functional/cosmetic symmetry and mobility. The patient is asked to adopt different facial expressions, each of those is scored between 0 and 2, where (0) no movement, (1) partial or moderate movement and (2) full or marked movement. The maximum score to be reached is 40 points, so lower scores imply more affectation¹⁴.

The condition of the scars was measured according to the VSS, which assesses the pigmentation,

vascularity, flexibility and height, each with its respective aspects. Pigmentation and vascularity have scores from 0 to 3; flexibility from 0 to 5 and height from 0 to 4. The maximum score to be reached is 15, therefore, lower scores indicate greater affectation¹⁵. Besides, the patient was asked to state the degree of perception of the rigidity of his scars, in a scale of 0 to 10, where zero corresponds to the absence of rigidity and 10 to maximum rigidity¹⁵.

Therapy

Speech Therapy sessions were carried out during 12 months. The process included two stages. The first intensive phase lasted 6 months, with a frequency of two sessions each week. The second stage was a follow-up and lasted six months, with a frequency of one session per week. All sessions lasted 25 minutes on the average (the duration depended on the patient's tolerance). The purpose of the therapy was to use an integrative approach with a use of mixed techniques, MO, muscle balance massage and scars management to improve functionality and orofacial aesthetics^{18,19}. The intervention consisted in active orofacial exercises, digital manipulation of the scars, muscle balance massage and functional training. All this is summarized in Chart 1.

Chart 1. Techniques carried out during the therapy period

Process		Technique				
		ACTIVE OROFACIAL EXERCISES	DIGITAL SCARS MANIPULATION TECHNIQUES	MUSCLE BALANCE MESSAGES	FUNCTIONAL TRAINING	
Objective		<ul style="list-style-type: none"> • Increase oxygenation and amplitude of movements • Improve muscle mobility 	<ul style="list-style-type: none"> • Free adhesences • Improve tissue movement 	<ul style="list-style-type: none"> • Free adhered tissues • Increase the treated region temperature 	<ul style="list-style-type: none"> • Improve speech, chewing and oral phase of swallowing 	
Maneuver		<ul style="list-style-type: none"> • Nonverbal oral movements and isotonic exercises of the tongue, lips and cheeks 	<ul style="list-style-type: none"> • Horizontal and vertical zig-zag technique • Circular technique over the scar cord • Rolling clamp technique 	<ul style="list-style-type: none"> • Deep massages. • Intraoral digital manipulation techniques • In all the extension of the scar and fascia 	<ul style="list-style-type: none"> • Perception/awareness • Muscular/sensory training. • Training of the swallowing, speech and chewing functions. • Automation 	
Frequency	Intensive phase	7 movements	10 series	<ul style="list-style-type: none"> • On closed scars only. 3 minutes. 	<ul style="list-style-type: none"> • 10 minutes. 	<ul style="list-style-type: none"> • Perception/awareness • Muscular/sensory training and speech
	Follow-up phase	4 movements	5 series	<ul style="list-style-type: none"> • 2-3 minutes 	<ul style="list-style-type: none"> • 10 minutes 	<ul style="list-style-type: none"> • Functional work with foods and speech

Regarding the indications for home therapy, an exercises program was given (oral non-verbal exercises and isotonic tongue, lips and cheeks isotonic exercises) using *biofeedback*²⁰, consisting in the installation of a conscious operating system to avoid inadequate compensation movements at the orofacial level²⁰.

The therapy ended when the indicators for each parameter reached stability. That is to say, the therapy ended when it was observed that there was no engagement on the orofacial functions and that

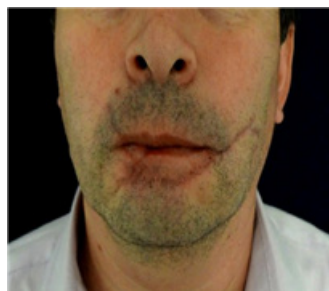
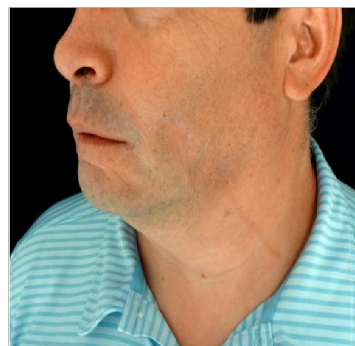
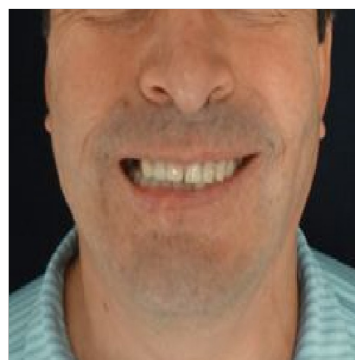
the value of the scales and items assessed were near and/or within the ranges expected (anthropometric measurements, facial mimic and scars)^{14,21,22}. The results of the assessments are shown in Table 2. The parameters correspond to orofacial motricity, anthropometric measurements, facial mimic and condition of the scars. The scores and the corresponding condition are recorded in the table and marked X for each assessed moment.

Table 2. Results of the parameters at the three assessment times

PARAMETERS	ASSESSMENT TIMING		
	START	6 MONTHS	12 MONTHS
Orofacial motricity			
a) Face harmony	A/S	A/M	A/L
b) Facial sensitivity	Ps	Ps	Ps
c) Pain on palpation			
Intraoral	8	7	0
Extra-oral	8	5	0
d) Damaged structures			
Lip	Hpe	Eu	Eu
Cheek	Hpe	Hpe	Eu
Chin	Hpe	Hpe	Eu
Teeth	P8	P6 / R2	P1/R7
e) CCCM functions			
Chewing	A	A	Ps
Swallowing (oral phase)	A	Ps	Ps
Speech	A	A	Ps
Oral antrop. measurements			
a) Vertical opening	18	28	38
b) Horizontal opening	26	33	42
Facial mimic			
	7	25	38
Scars			
Vancouver Scale points	3	7	12
G° rigidity perception	10	6	0

Abbreviations: A/S = Severe Asymmetry; A/M = Moderate Asymmetry; A/L = Slight Asymmetry; Ps = Preserved; Hpe = Hypertrophy; Eu = Eutrophic; Hpo = Hypotrophy; P8 = Loss 8 pieces; P6/R2 = Loss 6 pieces and Recovery 2 pieces; P1/R7 = Loss 1 piece and Recovery 7 pieces; A = Altered; Pje = Points; G° = Degree

Considering what is shown in Table 2, it must be pointed out that facial sensitivity was assessed to verify if there was impairment to the innervation of the zone: it was observed that it was preserved at all times. To back the results shown, the information is complemented with photographs of the scars condition and of the facial mobility of the patient at 6 months (Figures 2 and 3) and at the end of the therapy (Figures 4 and 5).

**Figure 2.** Front view at 6 months**Figure 3.** Left side view at 6 months**Figure 4.** Left side view at 12 months**Figure 5.** Risorius movement at 12 months

DISCUSSION

In this study, assessments were carried out at three times during the therapeutic process to measure its progress, determine the impairment of the CCMC structures and functions, as well as to verify the effects of the use of mixed techniques as complementary strategies to the surgical interventions. In this case, significant improvements (quantitative and qualitative) were observed between the initial and final condition, in all aspects of each parameter, recognizing that they responded to the set of interventions on the patient (surgery, kinetics and MO). This agrees with what has been pointed out by the integrative approach that assumes an interdisciplinary interdependence¹¹.

As regards chewing, swallowing and speech, it must be mentioned that the functional difficulties shown by the patient could be prior to the accident, that is to say, not fully associated to the trauma. In this sense, the observed variation could be explained because the patient followed the indication and maintained the patterns exercised during the intervention, thus supporting the functions. Concerning the anthropometric measurements, the vertical data comply with what has been pointed out in diverse studies^{11,16,17}. And as for the horizontal measurement, this antecedent is reported and could be useful for further studies.

Regarding scars, although the process is a disorganized response that alters the adequate synthesis of collagen¹⁰, techniques such as those implemented in this case showed their contribution, lowering risks of bad healing and promoting a better recovery. In fact, the scars represented a mechanical obstacle in the intervention carried out, because remission does not happen without a direct intervention, it being important to work on the tissues, muscles and functions referred to the structure-function relationship¹¹. Thus, muscle balance massages (deep manipulation, stretching and intraoral techniques) were implemented to release the adhered tissues and soften the scar, because the pressure was firmly applied to each the deeper muscles^{23,24} and the intraoral techniques were carried out by direct digital manipulation on the scar: this caused the temperature to rise in the region being treated and also vasodilation¹⁰, fostering improvements in the condition of the scars and consequently on the functions. Therefore, taking care of the scars was the main focus of the intervention, because, the longer they remain retracted and without mobility, sequels appear that can functionally reduce the facial muscles

movements and promote hypertrophy, and lifelong damages sequels.

A limiting factor for this study was the scarcity of specific assessment tools for scars, for the type of damage study (cut in soft tissues in CCMC) and the lack of specialized literature about techniques, which would have allowed to compare procedures.

FINAL COMMENTS

Although the results obtained are not to be generalized, they can be considered as hopeful. In this sense, it can be observed that it is necessary to build more evidence to back up the intervention in scars and show the possible contributions from MO in speech therapy, being essential to contribute constructively and collaboratively so that specialists may agree on the techniques to be used in the approach to these patients.

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