Journal of Oral Biology and Craniofacial Research 14 (2024) 17–21

Contents lists available at ScienceDirect

Journal of Oral Biology and Craniofacial Research

journal homepage: www.elsevier.com/locate/jobcr

Post-burn deformity of the orofacial complex region: An Orthodontic approach

Veerendra Prasad, Lobsang Chhodon *, Vijay Kumar

Department of Plastic and Reconstructive Surgery, K.G.M.U, Lucknow, Uttar Pradesh, India

1. Introduction

Post-burn neck contracture is one of the most prevalent burn sequelae. Burn scars around the head and neck are frequently noticeable and draw unfavourable attention to the victims. A permanent flexion deformity in the mandible and catastrophic effects on future growth and the morphology of orofacial structures are both possible consequences of severe neck contractures.[1,2] In addition, these types of scars have a severe influence on a child's physiological and psychological health, which may result in psychosocial issues in the future.[3] Severe postburn neck contractures can affect soft tissue and bone, frequently leading to mandibular retrusion, restricted growth of the arch, limited mandibular movement, and deformity of the lip, chin, neck, and chest.[4] There is an abundance of information available on burns to the head and neck, much of it focusing on surgical and physiotherapeutic procedures and outcomes.[4–8] However, there is a highly alarming lack of information on using orthodontics to address both functional and acceptable aesthetic demands in burn patients. The purpose of this article is to present a case of post-burn contracture of the face and neck and the role of an Orthodontist.

Case: A 22-year-old female reported with the chief complaint of an unesthetic facial appearance along with drooling saliva. The patient had a history of thermal burns when she was 16 years old, and an initial neck contracture was released by plastic surgeon colleagues at the age of 20 years. The patient claimed that her occlusion was normal before the incident and that the malocclusion had developed gradually to the present state.

On clinical examination, the patient presented with a neck burn scar contracture, long face pattern, and an enlarged inter-labial gap. The patient had an everted lower lip and was unable to close her mouth. Intraoral examination revealed flared mandibular incisors with spacing in the lower arch. The molar relation was Class III bilaterally with a severe anterior open bite of 16 mm and a reverse overjet of 14 mm (Fig. 1).

On cephalometric analysis, the patient presented a high mandibular plane angle (FMA = 32°, Go.Gn-Sn = 36°). Steiner's analysis revealed a prognathic maxilla (SNA = 85°), and an orthognathic mandible (SNB = 79°). The Wits appraisal indicated a large anteroposterior discrepancy between the maxilla and mandible (-6 mm). The mandibular plane angle was steep and the gonial angle was severely increased. The incisal angle was found to be 46° (Fig. 1, Table 1).

Treatment objectives were to correct the profile, reduce the lower facial height, widen the arch, and obtain functionally optimum occlusion. The treatment plan called for alignment and levelling of teeth, uprighting posterior teeth, followed by consolidation of spaces. Reassessment of the case based on the outcome of the first phase of treatment for orthognathic surgery or camouflage treatment.

2. Treatment progress

A 0.022" × 0.028″ Roth-prescription pre-adjusted edgewise appliance was bonded in both arches. Sequential NiTi wires were used for alignment and levelling. A removable posterior bite plane was given. Subsequently, 0.016 × 0.022″ and 0.017 × 0.025″ SS were used. In between orthodontic treatments, the patient had neck contracture released using a split-thickness skin graft (SSG). The anterior open bite reduced from 16 mm to 6 mm after the first phase of treatment (Fig. 2). After re-evaluation of the case following space consolidation, extraction of the mandibular first premolars were planned. The mandibular anterior was retracted following extraction and the remaining open bite was closed using vertical intermaxillary elastics. The lower lip contracture was released with a full-thickness graft (FTG) by Plastic Surgeon colleagues.

After 3 years of orthodontic treatment, functionally and aesthetically optimum occlusion has been achieved. Overjet was reduced from −14mm to 2 mm and overbite from −16mm to 1 mm (Fig. 3). Cephalometric measurements show improvement in mandibular plane angle, anteroposterior discrepancies, and angulations of incisors (Table 1). A Hawley retainer in the upper and lower arch along with a posterior bite in the lower arch were given for retention.

In post-burn neck contracture patients, there is always a possibility of recurrence. Waymach reviewed 143 neck release procedures and

* Corresponding author. Department of Plastic and Reconstructive Surgery, K.G.M.U, Lucknow, Uttar Pradesh, 226003, India.
E-mail addresses: veerendrapd@yahoo.co.in (V. Prasad), chhoddon@gmail.com (L. Chhodon), kuhuvidush@hotmail.com (V. Kumar).

https://doi.org/10.1016/j.jobcr.2023.11.007
Received 8 June 2023; Received in revised form 14 November 2023; Accepted 30 November 2023

Fig. 1. Pre-treatment clinical photographs and radiographs showing dento-maxillo-facial deformities.

Table 1
Cephalometric measurements.

	PRE	POST
FMA	32°	29°
MP-FH	33°	30°
Go.Gn-Sn	36°	34°
Wit's Appraisal	-6mm	-1mm
Inter incisal angle	46°	105°
SNA	85°	84°
SNB	79°	80°
ANB	6°	4°

observed a 17 % risk of contracture recurrence after wounds were released using skin grafting.[9] Therefore, the patient was advised to wear a cervical collar, massage, maintain range of movement, and receive physiotherapy as an essential part of rehabilitation.

3. Discussion

The neck skin is flexible, elastic, and relatively thin (0.5–0.7 cm). The flexion, extension, and rotation of the neck are associated with several horizontal skin creases on the neck. Scar contractures are reasonably quickly formed on the neck after severe burns. Severe neck contractures can cause fixed flexion deformities in the mandible.[4] Flexion deformity of the body of the mandible also leads to the anterior open bite along with dental compensation as seen in this patient. According to Moss, a custom-fit bony complex is created when the developing craniofacial skeleton and the surrounding soft tissue are in a state of physiological and biomechanical balance.[10] Oro-facial complex development may be negatively impacted by any abnormalities in the oro-facial capsular matrix. One such possible soft tissue effect on the eventual face skeletal and dental structure is the deforming pressure of scar contracture associated with untreated burns in the head and neck area.[5] In a series of 43 cases of electrical burns to the mouth, Thompson discovered that seven individuals experienced dental changes, such as a crossbite, crowding, and retrusion of the bite.[11] Nahlieli O *et al*[1] discussed a case of severe face and neck burn accompanied by extreme facial skeletal deformity with Class III malocclusion (SNA = 81 and SNB = 83) treated by alignment of teeth followed by orthognathic surgery consisting of bilateral intraoral oblique osteotomy, anterior subapical mandibular osteotomy, and genioplasty using silicone implants.

Masson and Janvie[12] studied 23 individuals who had substantial burn scar contractures of the neck as a result of childhood injury and severe dento-maxillo-facial abnormalities that persisted into adulthood. In these individuals, cephalometric examination revealed that, contrary to clinical evaluation, there was chin profile retrusion and that scar contracture affected mandibular bone development, both in length and periosteally as seen in our case.

Lower lip postburn deformity is more prevalent and incapacitating than upper lip postburn deformity.[13] Lower lip eversion, a frequent complication of lower lip burns, breaks off the equilibrium between the muscles and the teeth, leading to flared mandibular incisors.

Both functionally and aesthetically, the patient may find this to be quite unpleasant. The best outcomes may be attained when patients are treated by a team that includes orthodontists, plastic surgeons, and/or maxillofacial surgeons.

Fig. 2. Mid-stage treatment showing reduced open bite from 16 mm to 6 mm.

Fig. 3. Post-treatment clinical photographs and radiographs showing improved overjet, overbite and angulation of incisors with.

4. Conclusion

Reconstruction efforts for post-burn patients should focus on both the patient's functional requirements and a satisfying cosmetic restoration. For the purpose of enhancing aesthetics and regaining dynamic function, orthodontic and surgical correction of the resulting deformity is recommended.

References

1. Nahlieli O, Kelly JP, Baruchin AM, Ben-Meir P, Shapira Y. Oro-maxillofacial skeletal deformities resulting from burn scar contractures of the face and neck. *Burns : journal of the International Society for Burn Injuries*. 1995;21(1):65–69. https://doi.org/10.1016/0305-4179(95)90786-y.
2. Prashantha SJ, Mahendra SM. Post burn deformity : a rare etiology for maxillofacial disturbances and treatment strategy with team work. 2012;3(6).
3. Grevious MA, Paulius K, Gottlieb LJ. Burn scar contractures of the pediatric neck. *J Craniofac Surg*. 2008;19(4):1010–1015.
4. Zhang YX, Wang D, Follmar KE, et al. A treatment strategy for postburn neck reconstruction: emphasizing the functional and aesthetic importance of the cervicomental angle. *Ann Plast Surg*. 2010;65(6):528–534. https://doi.org/10.1097/SAP.0b013e3181cc29e7.
5. Katsaros J, David DJ, Griffin PA, Moore MH. Facial dysmorphology in the neglected paediatric head and neck burn. *Br J Plast Surg*. 1990;43(2):232–235. https://doi.org/10.1016/0007-1226(90)90167-x.
6. Lellouch AG, Ng ZY, Pozzo V, Suffee T, Lantieri LA. Reconstruction of post-burn anterior neck contractures using a butterfly design free anterolateral thigh perforator flap. *Arch Plast Surg*. 2020;47(2):194–197. https://doi.org/10.5999/aps.2019.00591.
7. Ali H, Pervez M, Khyani I, Sami W, Muneeb D. Post-burn neck contracture: effectively managed with supraclavicular artery flap. *Ann Burns Fire Disasters*. 2019;32(4):301–307.
8. Jerome TJ, Sabtharishi V, Sk T. Supraclavicular flap for severe post-burn neck contracture in children. *Cureus*. 2021 Jan 25;13(1), e12910. https://doi.org/10.7759/cureus.12910. PMID: 33654595; PMCID: PMC7905012.
9. Cronin TD, Barrera A. Deformities of the cervical region. In: McCarthy JG, ed. *Plastic Surgery*. vol. 3. 1990:2057–2093.
10. Moss ML, Salentijn L. The primary role of functional matrices in facial growth. *Am J Orthod*. 1969;55(6):566–577.
11. Tompson HG, Juckes AW, Farmer AW. Electric bums to the mouth in children. *Plast Reconslr Surg*. 1965;35:466–477.
12. Masson CL, Janvier H. Dento-maxillo-facial deformities resulting from scar contractures of the neck developed after burns sustained in childhood. *Ann Chir Plast*. 1972;17:254–259.
13. Neale HW, Billmire DA, Carey JP. Reconstruction following head and neck burns. *Clin Plast Surg*. 1986;13(1):119–136.