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Full thickness facial burns: Outcomes following orofacial rehabilitation

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ABSTRACT

Purpose: To document orofacial rehabilitation and outcomes after full thickness orofacial burn.

Methods: Participants included 12 consecutive patients presenting with full thickness orofacial burns. A group of 120 age-matched healthy participants was recruited for normative comparison. Non-surgical exercise was initiated within 48 h of admission and continued until wounds had healed, circumoral scar tissue had stabilised and functional goals were achieved to the best of the patient's ability. Outcomes were documented using vertical and horizontal mouth opening measures at start and end of treatment and therapy duration was recorded.

Results: At commencement of treatment, participants had significantly ($p < 0.001$) reduced vertical and horizontal mouth opening range compared to controls. Average duration of orofacial contracture management was 550 days, with half requiring >2 years rehabilitation. By end of treatment, significant ($p < 0.01$) positive improvement in vertical and horizontal mouth opening had been achieved, however measures had returned to lower limits of normal function and remained significantly ($p < 0.05$) reduced compared to the control group.

Conclusion: This study demonstrates that although positive gains can be achieved through non-surgical exercise after full thickness burn, the duration of rehabilitation is considerable and some degree of long term loss in functional mouth opening remains.

1. Introduction

Full thickness burns to the orofacial region represent damage which extends beyond the epidermal and dermal layers of the skin. Management of full thickness orofacial burns frequently involves both surgical management (including debridement with or without grafting) as well as non-surgical scar management post-operatively. Full thickness injury of the orofacial region is well accepted in the literature to be a complex area to treat. Despite intervention, this region is prone to persistent

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scarring and contractures that manifest in many functional and aesthetic sequelae [1,2] such as poor oral opening and closure for the purposes of oral intake, oral/dental hygiene, intubation, as well as deficits in communicative ability characterised by impairments in articulation and facial expression [3–8].

Several treatment techniques have been described to manage the patient at risk for orofacial contractures [9–22]. Early initiation of exercise, splinting, pressure, massage and silicone are currently accepted as standard burn scar rehabilitation practice [23]. However there is currently a paucity of evidence to support any one particular treatment regime and furthermore there is limited evidence to support the efficacy of orofacial treatment in adult facial burn, particularly with reference to functional outcome.

Only a handful of studies currently exist which describe orofacial contracture outcomes following full thickness orofacial burn. These include one cohort study [24], one small case series [7] and a number of single case reports [3–5,25–27]. The cohort study by Koller et al. [24] examined vertical and horizontal mouth opening outcomes in patients following surgical debridement of burns to the face. They identified that patients requiring surgical wound closure experienced greater loss of range of movement compared to those who did not require grafting. The limitations of this study however are that it is retrospective and outcomes were collected only following wound healing and maturation. Additionally, any non-surgical treatment that the patients may have received was not detailed. Only the single case reports and case series studies have documented functional outcomes both prior to and following non-surgical treatment for orofacial contractures. Non-surgical management was reported to involve varying combinations of exercise, splinting, massage, pressure and contact media [3–5,7,25–27]. The durations of treatment are difficult to ascertain as the focus was frequently on the time taken to achieve maximal gain. These studies all described utilising linear mouth opening measures in the vertical and horizontal dimension as their outcome measure and despite some differences in extent of benefit, positive gains were reported for all participants following non-surgical intervention.

Although this existing literature supports the benefits of orofacial contracture management for patients with full thickness burns, the predominance of single case studies and the lack of prospective cohort studies limits the quality of the evidence base available to date. The current study aims to quantify the extent of impairment post full thickness facial burn and describe outcomes relating to orofacial rehabilitation in a cohort of patients with full thickness facial burn, studied prospectively.

2. Methods

2.1. Participants

All patients attending Concord Repatriation General Hospital over a 3 year period (February 2011–February 2014) with full thickness orofacial burn were recruited to participate in the study. Full thickness orofacial burn was defined as a burn sustained to the orofacial region characterised by epidermal and dermal loss requiring surgical wound management (debridement and grafting) or greater than or equal to 21 days to achieve wound healing. Participants were excluded from the cohort if their prognosis was deemed poor and they were unlikely to survive hospital admission, had experienced previous burn to the orofacial region, had previous surgery to the lips (e.g. excision of squamous cell carcinoma), were unable to be monitored through to treatment completion (e.g. they were an overseas visitor), or demonstrated total non-compliance with completing non-surgical exercise. Based on these criteria, 9 patients were excluded from the study: five had passed away within week/s post injury, 2 were unable to be followed up due to overseas status, and 2 demonstrated complete non-compliance with non-surgical exercise. The final cohort of 12 patients who were eligible to participate consisted of 4 males and 8 females with a mean age of 41 years (range 17–61, SD 13.18). Individual patient and burn demographic data along with treatment and outcome data are detailed in Table 1.

All patients received early surgical debridement of their facial burns, with 7 receiving early facial grafting, and 5 initially receiving Biobrane® followed by subsequent facial grafting once either wound healing was not able to be achieved and/or donor skin became available. Seven patients subsequently required surgical mouth angle release due to non-surgical exercise being insufficient to maintain adequate mouth opening (Table 2). The point at which these 7 required contracture release varied with most undergoing surgery after their initial acute care admission. Table 2 details these 7 patients including their pre-treatment mouth opening measures, days to surgical mouth angle release, pre- and post-surgery mouth opening range (within 1 month of surgery), and final mouth opening range after treatment cessation.

2.2. Healthy controls

A group of 120 age-matched healthy controls (60 male, 60 female, mean age 41.5 years, range 16–80 years) was recruited to establish normative data for mouth opening range. Twenty male and 20 female control participants at each of the age ranges of 16–30 years, 31–50 years, and 51–80 years, were selected to ensure equal age and gender distribution. For inclusion, participants required no prior history of orofacial burn, and no head and neck or craniofacial surgery or other condition that may impact on oromotor function.

2.3. Orofacial contracture management

The therapy regime consisted of a combined exercise and stretching regime targeting active range of movement mouth stretches developed by the lead author and described in Rumbach et al. [11] p.189. A second clinician, trained by the lead author, also provided treatment and measured outcomes following the same therapy regime over the study period. The frequency of practice prescribed was 10 repetitions of each exercise, 5 times daily. A mouth splint regime was also instituted, consisting of 1 h application twice daily of the Free Access II Cheek Retractor® (www.morita.com) as described in Clayton et al. [3] and Clayton et al. [4]. Nine of the 12 patients required additional assisted vertical mouth stretching due to further loss of mouth opening despite adherence to active range of movement exercise and the mouth splint programme.