

# FREY'S SYNDROME FOLLOWING A FACIAL BURN TREATED WITH BOTULINUM TOXIN

## SYNDROME DE FREY AU COURS D'UNE BRÛLURE FACIALE TRAITÉE PAR TOXINE BOTULIQUE

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**SUMMARY.** Frey's syndrome occurs as a result of damage to the auriculotemporal nerve, which causes inappropriate regeneration of damaged parasympathetic fibres to salivary glands to innervate the sympathetic receptors of sweat glands in the face. The symptoms are pathological flushing and sweating with gustatory stimuli. It most commonly occurs following parotid surgery and has not previously been reported following burn injury. We present a 50-year-old man who sustained 1% TBSA full thickness burn to the right side of his face as a child. This was excised and reconstructed with skin grafts as well as further revision procedures in his adult life. He incidentally reported copious amounts of gustatory sweating over his right temple region that had been present since his initial injury, occurring prior to any reconstruction, consistent with Frey's syndrome. This was confirmed with a starch iodine test, and successfully treated with Botulinum toxin injections post reconstruction. This case is the first report of Frey's syndrome following burn injury. We highlight the potential development of Frey's syndrome following facial burns, even in the reconstructed area. Botulinum toxin treatment remains effective.

**Keywords:** facial burn, Frey's syndrome, botulinum toxin

**RÉSUMÉ.** Le syndrome de Frey est le résultat d'une lésion du nerf auriculo-temporal. C'est la régénération aberrante, au cours de leur trajet vers les glandes salivaires, des fibres parasympathiques endommagées innervant les récepteurs sympathiques des glandes sudoripares de la face, qui en est responsable. Les symptômes sont une rougeur pathologique et une hypersudation lors de stimulations gustatives. Il apparaît plus généralement lors de la chirurgie parotidienne et n'a jamais été rapporté après une brûlure. Nous rapportons l'observation d'un homme de 50 ans qui avait présenté dans l'enfance une brûlure profonde du côté droit du visage (surface 1 %). Cette brûlure avait été excisée et réparée par des greffes cutanées, et suivie de plusieurs retouches chirurgicales à l'âge adulte. Il décrivait, la survenue, lors de stimulations gustatives, d'importants phénomènes de sudation, au niveau de sa région temporale droite, et ce depuis le traumatisme initial et avant toute réparation réalisant un syndrome de Frey. Ceci fut confirmé par un test à l'iode-amidon et fut traité par des injections de toxine botulique après la reconstruction. Ce cas est le premier report d'un syndrome de Frey après une brûlure. Nous soulignons le développement possible d'un syndrome de Frey à la suite d'une brûlure de la face, évoluant même après sa réparation. La toxine botulique reste une thérapeutique efficace.

**Mots-clés:** brûlures de la face, syndrome de Frey, toxine botulique

### Introduction

Frey's syndrome occurs as a result of damage to the auriculotemporal nerve, which causes inappropriate regeneration of damaged parasympathetic fibres to salivary glands to innervate the sympathetic receptors of sweat glands in the face. The symptoms are pathological flushing and sweating with gustatory stimuli,<sup>1</sup> such as eating, the aroma of food, or even the thought of food.<sup>2</sup> It most commonly occurs following parotid surgery but has also been reported following blunt and penetrating trauma, parotiditis, and herpes zoster infection. The diagnosis of Frey's syndrome is clinical, but can be confirmed on starch-iodine testing. This test consists of painting the patient's affected region with iodine and allowing it to dry. Starch is then applied to the painted area, and a gustatory stimulus,

such as lemon juice, is given to the patient to induce sweating. The starch reacts with the iodine in the presence of moisture to produce a blue-black iodide compound.<sup>3</sup>

### Case presentation

In this case we present a 50-year-old male who sustained a 1% TBSA full thickness burn to the right forehead, cheek and temporal region as a child. This was excised and reconstructed with split thickness skin grafts at the time of injury. Since presenting to our institution, he has undergone multiple scar revisions to his forehead, lipofilling to his cheek, and a lateral canthoplasty. Incidentally, at a follow-up clinic, he reported copious amounts of gustatory sweating over his right temple region that had been present since his original injury, prior to any

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reconstruction. This was consistent with Frey's syndrome. This was then confirmed using a starch iodine test. The patient was treated with 100 units of botulinum toxin type A (Botox™, Allergan) in 2.5ml of 0.9% saline, to half of the affected area. On follow-up at 3 months his symptoms had completely resolved in the treated area, and so the remainder of the symptomatic area was also treated.

### Discussion

This is the first reported case of Frey's syndrome following burn injury. Furthermore, the ability to develop hyperhidrosis in a skin grafted area is noteworthy.

Full thickness burns involve the entirety of the skin thickness, including the adnexal structures of the dermis. This results in disruption of the neuro-vascular supply as well as sweat gland ducts that are removed or disrupted. For donor skin, the vascular bed, neural connections and the duct portion of the sweat gland are disrupted by the harvesting procedure.<sup>4</sup> It has been shown that grafted skin is often not subject to heightened vascularity and sweat production during heat stress.<sup>5,6</sup> Furthermore, there is no evidence that this improves as the graft matures, and thus, sweat gland responsiveness remains the same.<sup>4</sup> Multiple studies have shown a reduction in sweating and vasodilation in skin-grafted areas, thought to be due to a combi-

nation of the initial injury and lack of sweat glands in the harvested skin.<sup>7</sup> It is therefore notable that hyperhidrosis has occurred within the skin grafted area in this case.

Spontaneous regeneration of sweat glands has not been known to occur, and the regeneration of sweat glands has been a key topic of stem cell research. Patients with deep burn injury often heal by hypertrophic scarring without regeneration of sweat glands and therefore lose the function of perspiration.<sup>8,9</sup> It can therefore be concluded that either the initial injury must not have been full thickness, as initially reported during the patient's childhood, or there were islands of surviving dermis within the reconstructed area.

Whilst there are no clearly defined recommendations on dosing, Botulinum toxin A has become a proven method for the treatment of gustatory sweating.<sup>10</sup> Intradermal injections of Botulinum toxin around the eccrine sweat glands inhibits the release of presynaptic acetylcholine and thus leads to temporary chemodeneration with the loss or reduction of sweating.<sup>11</sup> Symptomatic relief has been achieved in this case.

### Conclusion

In conclusion, we highlight the potential development of Frey's syndrome following facial burns, even in a reconstructed area. This can be treated successfully using botulinum toxin.

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### BIBLIOGRAPHY

1. Dunbar EM, Singer TW, Singer K, Knight H et al.: Understanding gustatory sweating. What have we learned from Lucja Frey and her predecessors? *Clin Auton Res*, 12(3): 179-84, 2002.
2. Reich SG, Grill SE: Gustatory sweating: Frey syndrome. *Neurology*, 13;65(11): E24, 2005.
3. Motz KM, Kim YJ: Auriculotemporal Syndrome (Frey Syndrome). *Otolaryngol Clin North Am*, 49(2): 501-9, 2016.
4. Crandall CG, Davis SL: Cutaneous vascular and sudomotor responses in human skin grafts. *J Appl Physiol* (1985), 109(5): 1524-30, 2010.
5. Ganio MS, Schlader ZJ, Pearson J, Lucas RA et al.: Nongrafted skin area best predicts exercise core temperature responses in burned humans. *Med Sci Sports Exerc*, 47(10): 2224-32, 2015.
6. Ganio MS, Gagnon D, Stapleton J, Crandall CG, Kenny GP: Effect of human skin grafts on whole-body heat loss during exercise heat stress: a case report. *J Burn Care Res*, 34(4): e263-70, 2013.
7. Davis SL, Shibasaki M, Low DA, Cui J et al.: Sustained impairments in cutaneous vasodilation and sweating in grafted skin following long-term recovery. *J Burn Care Res*, 30(4): 675-85, 2009.
8. Pontiggia L: Eccrine sweat gland regeneration: still a story of 'blood, toil, tears and sweat'. *Br J Dermatol*, 176(6): 1435-1436, 2017.
9. Zhang C, Chen Y, Fu X: Sweat gland regeneration after burn injury: is stem cell therapy a new hope? *Cytotherapy*, 17(5): 526-35, 2015.
10. Nolte D, Gollmitzer I, Loeffelbein DJ, Hölzle F, Wolff KD: Botulinum toxin for treatment of gustatory sweating. A prospective randomized study. *Mund Kiefer Gesichtschir*, 8(6): 369-75, 2004. Epub 2004 Oct 29.
11. Kreyden OP, Scheidegger EP: Anatomy of the sweat glands, pharmacology of botulinum toxin, and distinctive syndromes associated with hyperhidrosis. *Clin Dermatol*, 22(1): 40-4, 2004.