

The Crocodile Tear Syndrome

Hani Yousuf Naik¹, Mahima Goel², Nida Baloch³, Karan Thakkar⁴,
Suhani Sharma⁵, Nikita Saha⁶

¹Oral and Maxillofacial Surgeon – MDS, I.T.S Dental College and Research Centre, Greater Noida, Delhi NCR

²Professor – Department of Oral and Maxillofacial Surgery, Pacific Dental College and Research Centre, Udaipur, Rajasthan

^{3,4}Dental Surgeon – BDS, Pacific Dental College and Research Centre, Udaipur, Rajasthan

^{5,6}Intern – BDS, Pacific Dental College and Research Centre, Udaipur, Rajasthan

Corresponding Author: Hani Yousuf Naik

DOI: <https://doi.org/10.52403/ijrr.20220255>

ABSTRACT

The Gusto-lacrimal reflex (The syndrome of Unilateral Lacrimation) associated with eating or drinking was first described by Oppenheim in 1913 and further elaborated by Bogarad in 1928- who called it the SYNDROME OF “CROCODILE TEARS.”

The notion that the crocodile, a ferocious predator, will weep over a man’s head after it has devoured the body and then eat up the head too was the theme of one of the many scientific anecdotes of Pliny the Elder.

Keywords: Intermediate nerve of Wrisberg, Misdirection of regenerating nerve fibers.

INTRODUCTION

According to Chorobski, ^[1] the syndrome of unilateral lacrimation associated with eating or drinking was first described by Oppenheim in 1913 and then described in brief by Bogarad in 1928 who named it as the *Syndrome of Crocodile Tears*. The case reported by Bogarad was that of a young woman who had a chief complaint of tearing from one eye during eating. This complaint followed the recovery from facial paralysis of the same side. An additional 4 cases were reported by Ford ^[2] in 1933. All followed facial paralysis. In addition to facial paralysis, one of the patients had congenital syphilis. Axelson and Laage- Hellman called it the “Gusto-Lachrymal Reflex.” They reviewed

67 reported cases upto 1962 and added 16 more. By 1967, 92 cases had been reported in the literature.

In 1968, Regenbogen and Stein ^[4] reported a case who had the syndrome associated with Duane’s Syndrome. The Duane’s Syndrome or Turk-Stilling-Duane’s Syndrome is characterized by esotropia in the primary position, complete abolition of abduction, restriction in adduction, marked retraction of the eye on attempted adduction, narrowing of the palpebral fissure when adduction is attempted and a slight widening of the palpebral fissure when abduction is attempted. It is essentially congenital paralysis of the abducent nerve. In 1970, Spiers ^[5] reported a case of bilateral crocodile tear syndrome associated with unilateral facial paralysis.

ETIOPATHOGENESIS –

Ford ^[3] stated the syndrome of crocodile tears did not occur with the common Bell’s palsy. Chorobski ^[1] was not in agreement with this opinion. He, thereby, refuted this as he observed a fairly high incidence (8 out of 18 cases) that occurred following recovery from Bell’s Palsy. Boyer and Gardner ^[6] reported two cases in which the previous facial paralysis did not occur, but developed a as late sequel to sectioning of the greater superficial petrosal

nerve. Lutman ^[7] reported 3 cases of congenital crocodile tear syndrome.

This syndrome must be differentiated from the epiphora that results secondary to paralytic ectropion. The most commonly accepted mechanism for the pathogenesis of gusto-lacrimal reflex is that of misdirection of regenerating nerve fibers. This theory was first put forward by Oppenheim and later supported by Ford ^[2], Ford and Woodhall ^[8], Boyer and Gardner ^[6], Russin ^[9], Savin ^[10] and Jacklin. ^[11]

The theory of misdirection has been supported by the known misdirection of other facial nerve fibers which is evidenced by the often observed synkinesia of facial muscles following injury. Axelsson and Laage – Hellman ^[3] stated that all cases of gusto lacrimal reflex have synkinesias. Jacklin offered two possible pathways for the misdirection to occur.

Firstly, the site of the lesion is proximal to the geniculate ganglion, and fibers passing to the submandibular gland via the chorda tympani are misdirected during nerve regeneration into the greater superficial petrosal nerve fibers to the lacrimal gland.

The second pathway, consisting of lesions distal to geniculate ganglion, involves misdirection of the glossopharyngeal nerve fibers normally going to the parotid gland, by way of the lesser and superficial petrosal nerves to the lacrimal gland. Chorobski ^[1], on the other hand put forward a theory of cross-stimulation.

CROSS STIMULATION THEORY-

Chorobski ^[1] felt this cross – stimulation to be sympathetic in nature, the efferent impulses being transmitted from the central nervous system to the sphenopalatine ganglion along the internal carotid, the greater superficial petrosal and the vidian nerves.

The cases of congenital crocodile tear syndrome are usually associated with paralysis of the abducent nerve, with or

without the facial nerve paralysis and a pontine lesion is thought to be the etiological basis for it.

SURGICAL ANATOMY-

The parasympathetic pre ganglionic axons arise near the superior salivatory nucleus near the facial nerve nucleus, and travel as the intermediate fibers of Wrisberg with the facial nerve into the fallopian canal of the petrous portion of the temporal bone. The fibers then pass as the greater superficial petrosal nerve from the geniculate ganglion without synapse. A small branch from the tympanic plexus is then received, followed by unification with the deep petrosal nerve fibers to form the vidian nerve. The vidian nerve then runs to the pterygopalatine fossa, where the parasympathetic fibers synapse in the sphenopalatine ganglion. Post-sphenopalatine ganglionic fibers then pass via the zygomatic, temporal and lacrimal branches of the maxillary nerve to the lacrimal gland. (Figure 1)

The salivary fibers run in the intermediate nerve of Wrisberg, in the facial nerve, or in the glossopharyngeal nerve, to synapse in the otic ganglion and continue within the facial nerve in its chorda tympani. The latter joins the lingual nerve at the submandibular ganglion where they synapse and then travel to the submandibular gland.

The secreto-motor fibers for the parotid gland leave the skull with the glossopharyngeal nerve, re-entering the temporal bone just past the jugular foramen and then cross the inner tympanic wall. These salivary fibers then form the lesser superficial petrosal nerve. The lesser and the greater superficial petrosal nerves course in close approximation to each other, giving off a communicating branch prior to where the salivary fibers synapse in the otic ganglion, from where they pass into the parotid gland.^[11]

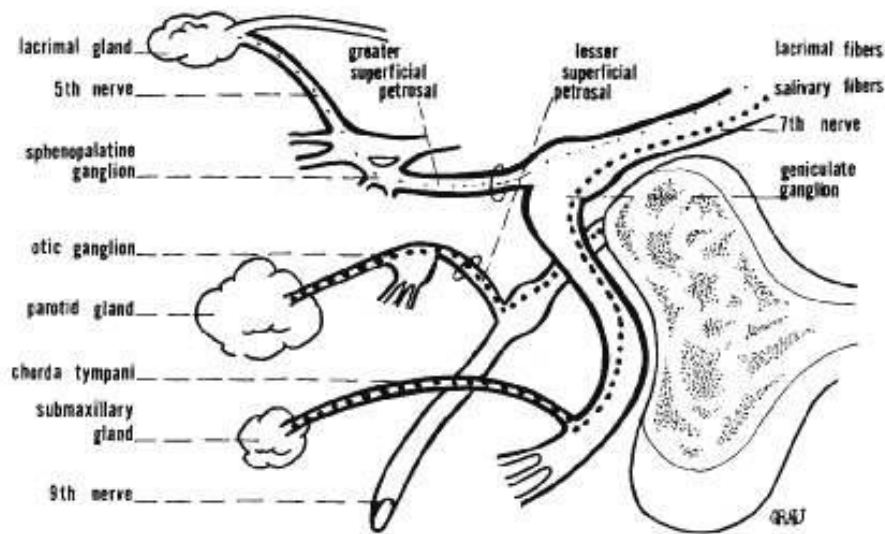


Figure 1 – The normal pathways for lacrimal and salivary nerve fibers . the circles here indicate the greater and lesser superficial petrosal nerves, through which misdirected salivary fibers travel to the lacrimal gland . (Adopted from Axelsson and Laage – Hellman)^[3]

TREATMENT –

The treatment of crocodile tear syndrome ranges from conservative to radical approach. Blockage of the postganglionic fibers of the sphenopalatine ganglion was suggested in 1939. Gottsfeld^[11] found this block to be effective with either cocaine or alcohol and he reported remission in one case over a period of 4 months.

Boyer and Gardner^[6] sectioned the greater petrosal superficial nerve and encountered a complete remission. They also have two cases in which the gusto-lacrimal reflex developed after sectioning the greater superficial petrosal nerve for headache. They even sectioned the glossopharyngeal nerve in two of the patients. One was successful whereas the other case was partially successful. For lesions distal to the geniculate ganglion, resection of the lesser superficial petrosal nerve has provided relief in a number of cases.^[6,11]

Golding-Wood^[12] has suggested resection of the tympanic branch of the glossopharyngeal nerve just proximal to the lesser superficial petrosal nerve, through a tympanic membrane approach. Savin^[11] offered resection of the palpebral portion of the lacrimal gland to his patients but,

because they had become accustomed to their problem, none accepted. Spiers^[5] and others have used anticholinergic drugs to reduce lacrimal secretion, but this was only effective at the expense of an unacceptable impairment of the accommodation power of the eye.

CONCLUSION

The mechanism of Crocodile tear syndrome appears to be a misdirection of the regenerating gustatory fibers that are related to the salivary glands, so that they become secretory fibers to the lacrimal gland and cause homolateral tearing during eating. A simple procedure, involving near total resection of the palpebral lobe of the involved lacrimal gland, proved to be an effective corrective measure in these cases. Although it was not performed in the cases cited above, it would perhaps be advisable to conduct a Schirmer's test^[13] to aid in determining the amount of gland that needs to be surgically removed.

Acknowledgement: None

Conflict of Interest: None

Source of Funding: None

REFERENCES

1. Chorobski, J: The syndrome of crocodile tears. Arch. Neurol. & Psych., 65 : 229, 1951.
2. Ford , F. R: Paroxysmal lacrimation during eating as a sequel to facial palsy : syndrome of crocodile tears . Arch . Neurol & Psych ., 29 :1279 . 1933.
3. Axelsson, A., and Laage – Hellman , J .: The gusto-lachrymal reflex . Acta Otolaryng., 54 :239. 1962
4. Regenbogen , L and Stein , R : Crocodile tears associated with homolateral Duane's syndrome . Ophthalmologica , 156 : 353, 1970
5. Spiers , A.S.D: Syndrome of “crocodile tears” Brit . J. Ophth., 54 : 330. 1970
6. Boyer , F.C., and Gardner , W.J .: Paroxysmal lacrimation (syndrome of crocodile tears) and its surgical treatment . Arch . Neurol and Psych . 61 : 56 , 1948
7. Lutman , F . C .: Paroxysmal lacrimation while eating . Am. J . Ophth ., 30 :1583, 1947.
8. For, F .R., and Woodhall , B .: Phenomena due to misdirection of regenerating fibers of cranial , spinal and automatic nerves . Arch .Surg ., 36 : 480,1938
9. Russin , L . A .: Paroxysmal lacrimation during eating as a sequel of facial palsy . J.A.M.A ., 113 : 2310, 1989
10. Savin , L , H .: A note on three cases showing “crocodile tears” after facial paralysis .Brit. J. Ophth ., 23 : 479 , 1989
11. Jacklin , H.N .: The gusto-lacrimal reflex (syndrome of crocodile tears) Am. J. Ophth ., 61: 1521 , 1966
12. Golding –Wood , P .: Crocodile tears . Brit M.J., 1: 1518, 1963
13. Callahan , A.: Reconstructive Surgery of the Eyelids and Ocular Adnexa , p.159. Aesculapian Publ. Co., Birmingham , 1966.

How to cite this article: Hani Yousuf Naik, Goel M, Nida Baloch et.al. The crocodile tear syndrome. *International Journal of Research and Review*. 2022; 9(2): 432-435. DOI: <https://doi.org/10.52403/ijrr.20220255>
