

## Transient extraocular muscle palsy following dental anaesthesia

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### Abstract

**Aim:** To present 3 unusual cases of transient extraocular muscle palsy following local dental anaesthesia for fillings or extraction of the upper fifth, sixth and/or seventh molars.

**Method:** Three cases are reported that presented to the Orthoptic Department with extraocular muscle palsy which occurred immediately following local anaesthesia for dental treatment.

**Results:** Two patients subsequently fully recovered and one was left with a slight superior oblique weakness. The result in this last case is thought not to have been caused by the local dental anaesthesia but by a longstanding weakness which seems to have been decompensated by the injection of the anaesthetic.

**Conclusion:** Transient muscle palsies linked to local dental anaesthesia may be common, but as they are so short-lived they do not present to the Orthoptic Department. Possible causes for the findings in these cases are discussed and the favoured aetiological hypothesis is stated.

**Key words:** Dental anaesthesia, Extraocular muscle palsy

### Introduction

Ocular complications following dental anaesthesia are rare and usually transient. Various authors<sup>1–4</sup> have reported third, fourth and sixth nerve palsies as a result of local dental anaesthesia administered in the area of the superior alveolar artery.

Local anaesthetics are usually administered by infiltration or, more rarely, by nerve block injections.<sup>5</sup> Infiltrations are used when the nerves supplying a particular structure are accessible and the agent can penetrate reasonably rapidly. Regional nerve block injections can be deposited at some considerable distance from the area to be anaesthetised. The anaesthetic agent is placed as close as possible to a larger nerve trunk using anatomical landmarks, to place the solution in the correct location.

Maxillary teeth are usually locally anaesthetised by infiltration. However, this technique is contraindicated if

the tooth is infected because there is a risk of spreading the infection. In such cases a nerve block injection can be used.

To administer an infraorbital nerve block the needle is introduced through the labia sulcus and the anaesthetic is deposited at the foramen, where it diffuses back through to anaesthetise the anterior superior alveolar nerve as well as the terminal branch of the infraorbital nerve itself.

When local infiltration of the upper molar or premolar teeth is contraindicated, a posterior superior alveolar nerve block is used. Anaesthetic solution is deposited to block the posterior superior alveolar nerve before it enters the maxilla. To ensure the needle does not lie in the pterygoid venous plexus an aspiration syringe should be used.

Three case studies are presented of patients who suffered extraocular muscle palsy after treatment to one or more of their upper fifth, sixth or seventh molars.

### Case reports

#### Case 1

A 61-year-old man presented with a history of horizontal binocular diplopia on right gaze. Onset followed local Novocaine dental anaesthesia, by infiltration injection, for an upper right seventh molar filling. The patient reported inability to abduct the right eye and, when looking in a mirror, noticed his right eye had become convergent. This occurred immediately following the injection and lasted for 2 hours. It was not possible to document the motility defect of the right eye as full ocular motility had been restored by the time the patient was seen in the Orthoptic department. It was concluded, from a very detailed and accurate account, that the patient had suffered a right lateral rectus palsy that resolved as the effects of the anaesthetic wore off.

#### Case 2

A 71-year-old woman presented with vertical and horizontal diplopia occurring shortly after local dental anaesthesia for the extraction of the upper left, sixth and seventh molars. The method used to introduce the anaesthetic is not known. The diplopia was worse on laevodepression and an orthoptic assessment revealed a left inferior rectus palsy. The patient had a left hypertropia that measured 4<sup>Δ</sup> on laevoversion. Fig. 1 shows this slight underaction. The patient was symptomatic at the initial visit and was given a 2D vertical Fresnel prism to join the diplopia. The patient was reviewed after 3 weeks, by which time the diplopia had

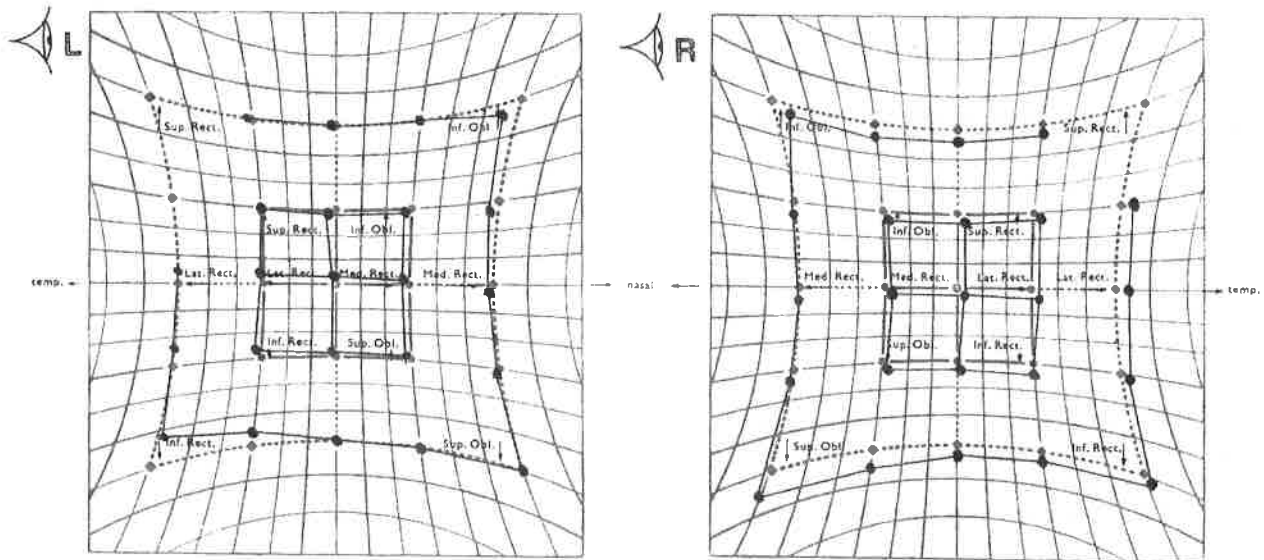


Fig. 1. Case 2. Slight left inferior rectus underaction.

completely resolved (Fig. 2). The patient had managed without use of the Fresnel prism from the outset, as the diplopia only lasted a few days. This patient had the added complication of a post-operative infection at the site of the extraction and this may have prolonged the duration of her diplopia compared with Case 1.

### Case 3

A 61-year-old man presented to the Eye Casualty Department with a history of vertical diplopia which had been present for 2–3 hours following local administration of 2% Xylocaine dental anaesthetic for the extraction of the upper fifth and sixth molars. The precise method of administration of the anaesthetic is unknown but, in the absence of infection, could be

presumed to be by infiltration. Orthoptic investigation revealed a very slight, concomitant vertical muscle imbalance. The patient's symptoms and the orthoptic findings suggested a very slight left superior oblique weakness. The cover test showed a minimal exophoria with good recovery at near and a minimal left hyperopia in the distance with diplopia, which has persisted (Fig. 3). As the patient remained symptomatic he has been managed with a 2D vertical prism, which he now has incorporated into his prescription. The local anaesthesia may have caused the breakdown of a longstanding superior oblique weakness, but there is no anatomical explanation to account for the weakness of this muscle being caused directly by the dental anaesthetic itself.

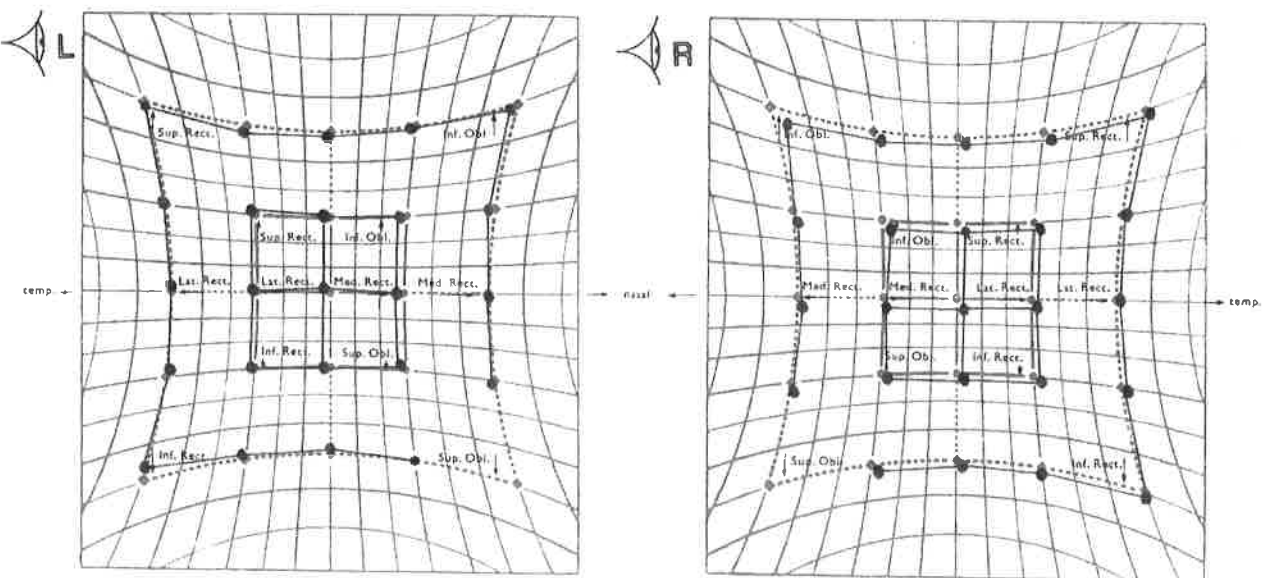


Fig. 2. Case 2. The inferior rectus underaction has resolved.

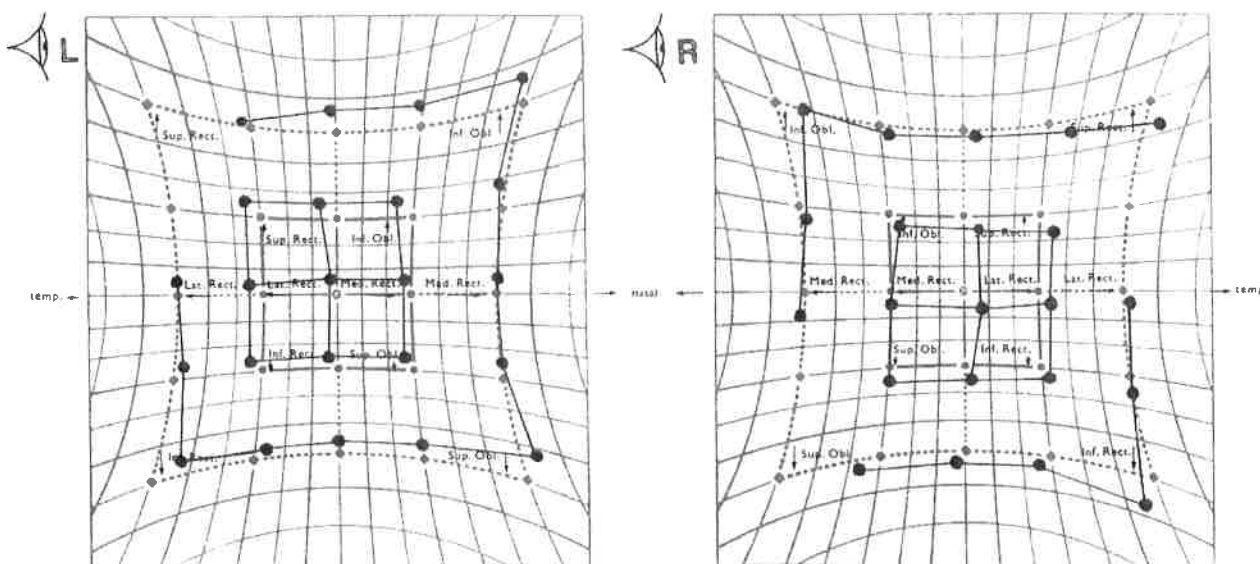


Fig. 3. Case 3. Slight underaction of the left superior oblique muscle.

**Discussion**

Transient ocular muscle palsies linked to local dental anaesthesia may be common, but as they are so short-lived they do not regularly present to the Orthoptic Department. Several different theories have been put forward to explain the cause of these muscle palsies.

The favoured aetiological hypothesis is that an accidental intra-arterial injection into the superior alveolar artery causes a retrograde flow of anaesthetic into the parent internal maxillary artery<sup>1,3,4</sup> (Fig. 4). Anaesthetic spreads via the orbital branch of the middle meningeal artery, which forms an anastomosis with the lacrimal branch of the ophthalmic artery supplying the sixth cranial nerve. In some patients, this anastomosis supposedly dominates the arterial supply of the orbit since the origin of the ophthalmic artery from the internal carotid is narrowed or absent.<sup>1</sup>

An alternative aetiological hypothesis suggests that

inadvertent injection into the pterygoid venous plexus leads to a retrograde spread of anaesthetic to the superior ophthalmic vein via the emissary vein and the cavernous sinus<sup>2</sup>, passing through the foramen ovale<sup>1,3</sup> (Fig. 5). An arteriovenous anastomosis between the superior ophthalmic vein and ophthalmic artery leads to a spread of anaesthetic to the lacrimal branch and thus to the cranial nerves within the orbit. As the venous vessels are devoid of valves, a reflux of the anaesthetic solution, due to the postural change of the patient may take place. Goldenberg<sup>1</sup> reported a patient who experienced diplopia only when she moved from the supine to the upright position. All three patients in our study reported an onset of diplopia when they were moved into the upright position. The reflux may be due to the difference in pressure gradient when moving from a supine to a vertical position.

A second alternative aetiological hypothesis suggests that during the use of infraorbital nerve blocks

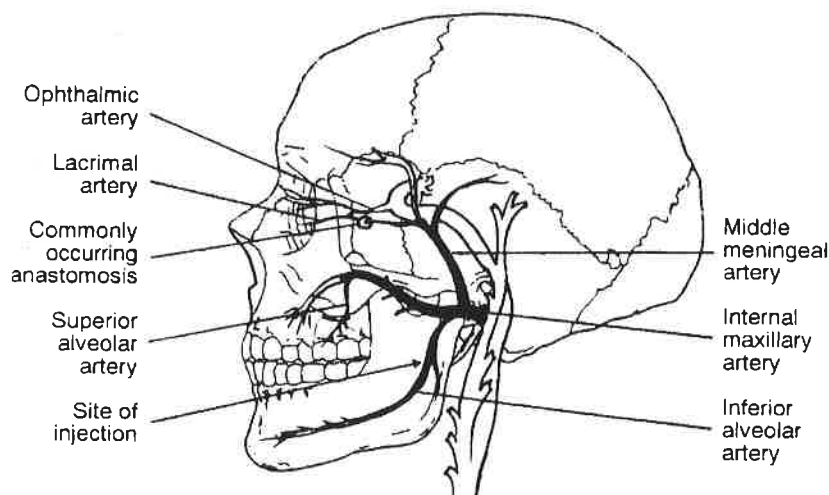


Fig. 4. The major branches of the internal maxillary artery and the commonly occurring anastomosis of the lacrimal artery and the middle meningeal artery through which the retrograde flow of anaesthetic spreads into the orbit.

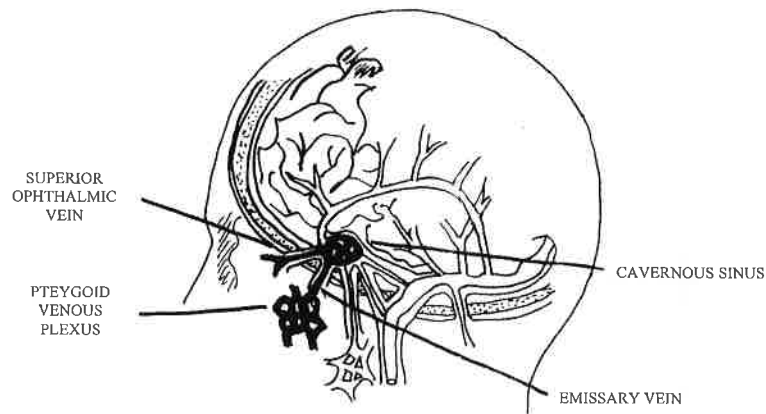


Fig. 5. Venous spread through the pterygoid venous plexus to the superior orbital venous system via the cavernous sinus and the emissary vein.

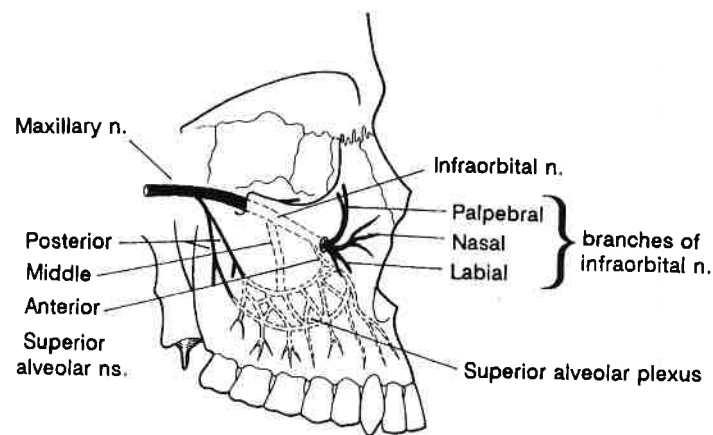


Fig. 6. Lateral view of the distribution of the major branches of the maxillary division of the trigeminal nerve. (Reprinted from Atkinson ME, White FH. *Principles of Anatomy and Oral Anatomy for Dental Students*, pp. 503–506, © 1992, with permission from Elsevier.)

anaesthetic diffuses through the infraorbital foramen into the anterior superior alveolar nerve as well as the terminal branches of the infraorbital nerve itself (Fig. 6). As a result anaesthetic may enter the orbit and cause extraocular muscle paralysis. It is advised that gentle pressure should be applied to the infraorbital margin while the injection is administered in order to prevent this complication.

### Conclusion

The majority of authors concur that anaesthetic solution injected into the maxillary areas reaches the eye and other orbital structures directly or indirectly via the interconnective vascular neural or lymphatic network. Van der Bijl and Meyer<sup>4</sup> reported that the complications presented by various authors developed following the procedure and usually resolved without sequelae within 5 hours.

Although the number of ocular complications associated with the administration of local anaesthetic injections in dental practice is relatively small, nevertheless

they do occur. Fortunately, these adverse effects are almost always transient and usually resolve completely; however, it is important that dental practitioners, ophthalmologists and orthoptists are aware of these potential complications so that, if they do occur, patients are reassured, informed and managed correctly.

We would like to thank M. E. Atkinson and Elsevier for kind permission to reproduce Fig. 6.

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