# THE PEAK LATENCY PROLONGATION OF THE BLINK REFLEX IN A PATIENT WITH TRIGEMINAL NEURALGIA OF MECKEL'S CAVE MASS

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**Background and aims** – The blink reflex test of the trigeminal nerve can provide valuable information about lesions site. However it may not find small compressive lesions.
**Case report** – We observed peak latency prolongation of the blink reflex test in a patient with trigeminal neuralgia caused by a small Meckel's cave mass, in whom the onset latency was normal.
**Conclusion** – We suggest peak latency of the blink reflex might be a valuable aid for discerning small mass in patients with trigeminal neuralgia. This is the first case report of compressive trigeminal neuralgia showing peak latency prolongation of the blink reflex test.

***Keywords:*** *trigeminal neuralgia, blink reflex, peak latency, Meckel's cave mass*

**A PISLOGÁSI REFLEXCSÚCS LATENCIÁJÁNAK MEGNYÚLÁSA EGY MECKEL-BARLANG-TERIME KÖVETKEZTÉBEN KIALAKULÓ TRIGEMINUSNEURALGIA ESETBEN**
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**Háttér és cél** – A trigeminus ideget vizsgáló pislogási-reflex-teszt hasznos információt nyújthat a laesiók helyéről. Előfordulhat azonban, hogy kis kompressziós elváltozások kimutatása nem lehetséges.
**Esetismertetés** – Megfigyeltük a pislogási reflexcsúcs latenciájának megnyúlását olyan trigeminusneuralgiában szenvedő betegnél, akinél egy kis Meckel-barlang-terime volt e tünetekért felelős, és a kezdeti (onset) latencia (onset) normális volt.
**Következtetés** – Vizsgálatunk alapján a pislogási reflexcsúcs latenciájának kimutatása értékes segítség lehet azoknál a trigeminusneuralgiában szenvedő betegeknél, akiknél valamilyen kis terime okozza a kompressziót. Ez az első esetbemutatás, ami kompressziós trigeminusneuralgiában a pislogási reflexcsúcs latenciájának megnyúlását igazolta.

***Kulcsszavak:*** *trigeminusneuralgia, pislogási reflex, reflexcsúcs-latencia, Meckel-barlang terime*

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The blink reflex test can provide valuable information about the peripheral and central trigeminopathy. However, this test may not reveal quite small compressive lesions[1]. The term blink reflex latency means the response of the fastest conduction fiber of the trigeminal nerve[2]. Clinicians used the conventional onset latency measurement of the blink reflex, however, the exact onset latency measurement is sometimes difficult especially when the nerve potential fluctuates at baseline,

which occurs in many pathological conditions[3]. Recently, we observed a peak latency prolongation of the blink reflex test in a patient with trigeminal neuralgia caused by a small Meckel's cave mass, whereas the onset latency of blink reflex was unremarkable. As far as we know, this is the first case report of compressive trigeminal neuralgia resulting peak latency prolongation of the blink reflex test.

## Case report

A 45-year-old man visited our clinic due to experiencing aggravated left cheek pain for over 6 months. He complained of having experienced spontaneous, left-side lancinating pain in the maxillary and mandibular areas. The patient had an unremarkable medical history. Upon examination there was no sign of sensory deficit in the trigeminal nerve dermatomes. Laboratory examinations were also unremarkable. To evaluate his trigeminal nerve function, we administered the blink reflex test to the patient according to the previously reported guidelines[3]. The active surface electrode was placed on the both sides of the belly of the orbicularis oculi. An isolated ground electrode was attached on his mid-forehead. We placed the reference on the side of his nose. We applied electrical stimulation over the supraorbital notch, using 15 mA intensity and 0.1 msec duration. To prevent habituation, we applied each stimulus 5 time set intervals of 2 sec. The electromyographic (EMG) settings for testing of the blink reflex are as follow: Frequency, 8ep Speed, 5 msec/div; and Gain, 50-100 μV/div. The blink reflex was tested with Sierra Wave from Cadwell (USA). During the test the room temperature was kept at 22~26 . The blink reflex response latencies to supraorbital nerve stimulation on both sides were recorded.

The patient's blink reflex test results showed no definite abnormalities in the conventional onset latency measurement (left side onset latency of $R_1$, 10.00 msec; right side onset latency of $R_1$, 10.05 msec; normal value: 10.6±2.5 msec, **Figure 1** & **Table 1**). However, compared to the right side, the waveform of the left side blink reflex showed a fluctuating baseline potential and amplitude variation in the $R_1$. When we measured the $R_1$ peak latency, the left side $R_1$ peak latency showed greater delay than the right side (left side peak latency of $R_1$, 16.52 msec; right side peak latency of $R_1$, 13.54 msec; left-right side differences of $R_1$ peak latency, 2.98 msec; **Figure 1** & **Table 1**). This peak latency differentiation of the blink reflex suggested a possi-

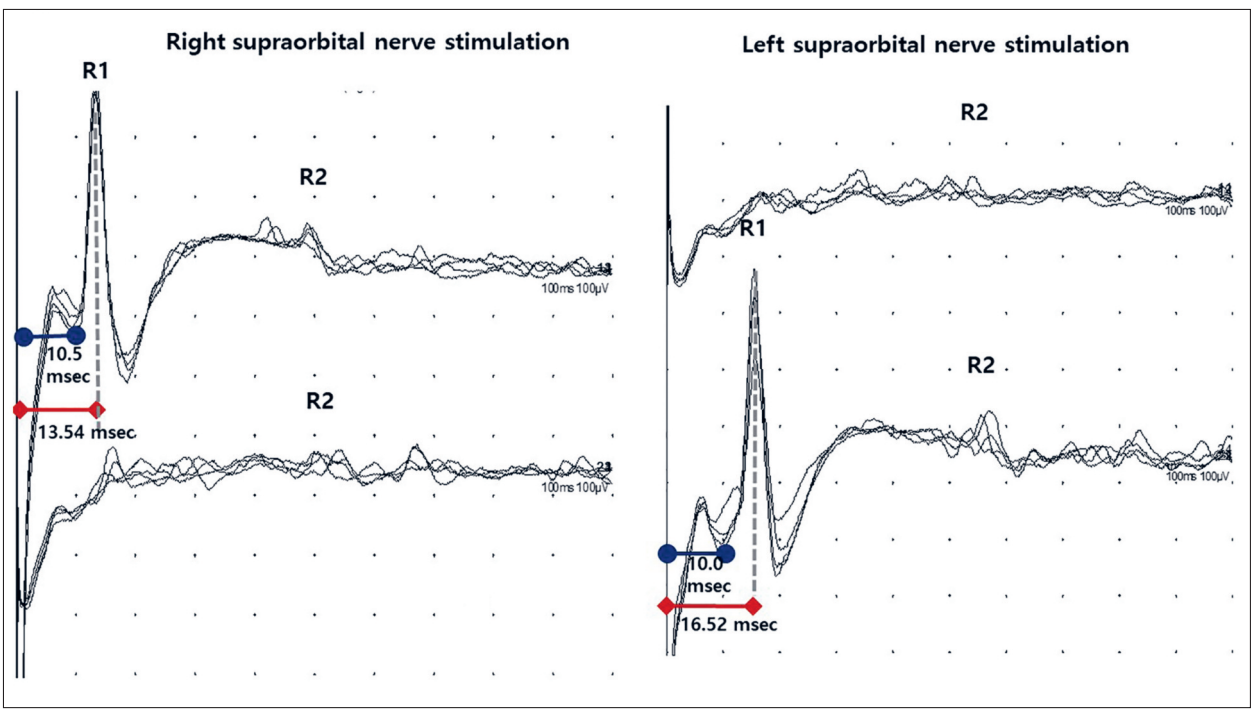


**Figure1.** *The patient's blink reflex test showed unremarkable onset latency but a side difference of the peak latency of R1 on the orbicularis oculi during left supraorbital nerve stimulation was observed. The blue and red lines represent onset and peak latencies of the blink reflex, respectively*

**Table 1.** *The results of the patient's blink reflex test*

| Stimulation | Response | Onset $R_1$ | Peak $R_1$ | Peak $R_1$ – Onset $R_1$ | $R_2$ |
|---|---|---|---|---|---|
| Right supraorbital nerve | Ipsilateral | 10.05 ms | 13.54 ms | 3.49 ms | 37.70 ms |
| | Contralateral | | | | 36.20 ms |
| Left supraorbital nerve | Ipsilateral | 10.00 ms | 16.52 ms | 6.52 ms | 35.45 ms |
| | Contralateral | | | | 38.35 ms |

Onset $R_1$: onset latency of $R_1$, Peak $R_1$: peak latency of $R_1$

ble afferent defect involving the left trigeminal nerve. Based on these findings, we performed thin slice magnetic resonance imaging (MRI) with gadolinium, from the Gasserian ganglion to the peripheral branch. The MRI revealed a 1.1 × 1.2 × 1.3 cm, well-defined, lobulated mass in the left Meckel's cave. The lesion was slightly hypointense on T1-weighted imaging with inhomogeneous high-signal intensities on fat suppression T2-weighted imaging, and it showed intense enhancement with focal cystic change **(Figure 2)**.

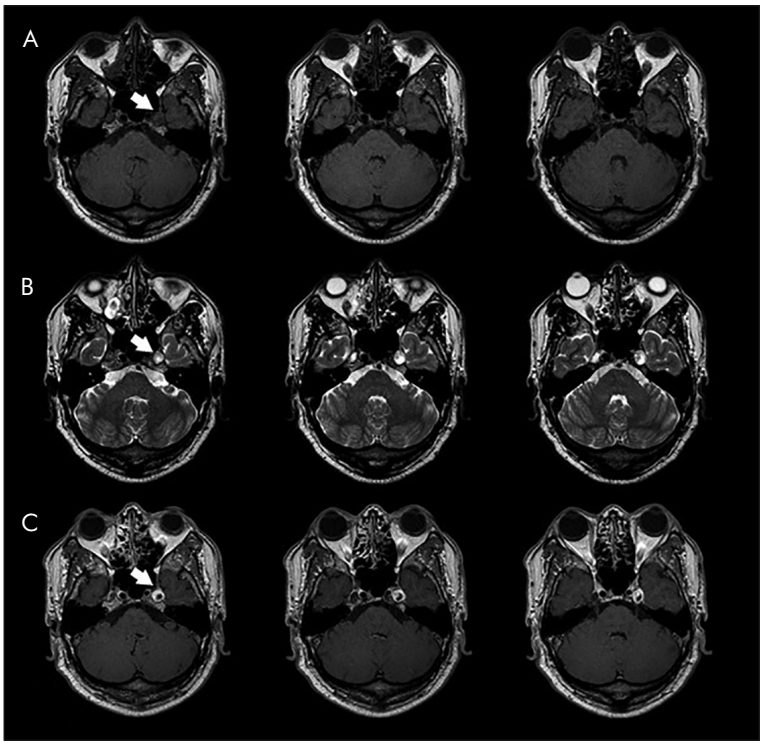


**Figure 2.** *The patient's thin-slice, gadolinium-enhanced MRI, which revealed a 1.1 × 1.2 × 1.3 cm, well-defined, lobulated mass (arrow) compressing the trigeminal nerve in the left Meckel's cave (arrow). The lesion was slightly hypointense on T1-weighted imaging* **(A)** *with inhomogeneous high-signal intense on fat suppression T2-weighted imaging* **(B)**, *and it showed intense enhancement with focal cystic change* **(C)**

## Discussion

Meckel's cave is a dural recess in the posteromedial portion of the middle cranial fossa that acts as a conduit for the trigeminal nerve between the prepontine cistern and the cavernous sinus. Although small, Meckel's cave is a complex space containing important structures such as the Gasserian ganglion and the proximal rootlets of the trigeminal nerve. Meckel's cave can be involved in various spectrum of pathological conditions such as congenital, infectious, inflammatory, vascular or neoplastic lesions[4]. The masses of Meckel's cave account for less than 0.5% of all intracranial lesions including nerve sheath tumours, perineural tumours and leptomeningeal metastases which are usually associated with trigeminal nerve dysfunctions[1, 4]. Key imaging features of pathology of Meckel's cave are effacement of cerebrospinal fluid signal in Meckel's cave, enhancement greater than the perineural vascular plexus, nerve enlargement with perineural fat plane effacement and osseous foraminal erosion[4]. In our patient the MRI of the brain showed an extraaxial mass filling and enlarging Meckel's cave on the left side, hypointense on T1-weighted imaging and hyperintense on T2-weighted imaging with enhancing cystic mass.

The EMG investigation of the trigeminal nerve reflexes, including the blink reflex, may provide valuable additional information about the site of a lesion that cannot be obtained with physical information[3, 5]. In the present case, the conventional onset latency measurement showed unremarkable findings on both sides. However, the peak latency measurement showed a greater delay on the left than on the right side, by 2.98 msec. In the blink reflex test, a side differentiation greater than 1.2 msec can constitute a remarkable finding[2, 3]. Onset

latency measures the intervals from stimulus onset to the initial deflection of the major negative deflection which represents the fastest fiber's conduction velocity. The peak latency measures from the onset of the stimulus to the peak of the major negative deflection which represents the average conduction of the group A-beta fibers[2, 3, 5].

The blink reflex is a polysynaptic reflex that is composed of an afferent arc through sensory nerve fibers in the trigeminal nerve and an efferent arc through motor nerve fibers in the facial nerve[2, 3]. Though the blink reflex arc has sensory ($R_1$) and motor ($R_2$) components, no previous report has discussed the meaning of onset and peak latency differences in the blink reflex.

It is unclear why this small lesion causes the peak latency prolongation while the onset latency and amplitude remain normal. There are several previous reports of trigeminal neuralgia caused by Meckel's cave mass[6–11], however as well as we know, only 2 cases showed abnormal blink reflex findings relevant to the lesion site[10, 11]. Unlike the present case, previous cases showed persistent focal neurological deficits in the affected area. The compressive masses of previous reports were large enough to interfere blink reflex potentials. The afferent pathway of the blink reflex test is usually the supraorbital nerve – a branch of the ophthalmic division. A small compressive lesion limited to the maxillary or mandibular division of Gasserian ganglion was too small to interfere with the blink reflex potential.

The latency of the blink reflex can be affected by non-pathologic factors such as the psychological condition of the subject, medication, wakefulness, and electrical stimulations[3]. In case of uncontrollable stimulus artifacts, peak latencies may be used instead. In the blink reflex tests, the conduction distances are rather small, and this inherent small distance between stimulus cathode and recording electrode may cause stimulus artifacts. These stimulus artifacts may hamper accurate defining of the onset latencies[12]. Because onset latency represents the fastest conducting fibers, we recommend to use initially onset latencies. However when significant variations in the onset latency of responses (latency jitter) are observed, we suggest the use of peak latencies additionally.

The most of the benign masses that give rise to symptomatic trigeminal neuralgia compress the trigeminal root in the posterior fossa, near its entry into the pons. The neurovascular contacts of trigeminal neuralgias take place in the same area. It is commonly believed that the trigeminal root entry zone represents a sort of locus minoris resistentiae due to changing from peripheral to central type of myelin sheet[6, 9]. However, the present case showed symptomatic trigeminal neuralgia originating from a mass at ganglion level.

This is a single case study and some limitations exist to generalize the peak-latency prolongation of this case. First, the postsurgical follow up blink reflex test was not performed. Second, we also recognize that our study represents a single case in a specific clinical situation, so more patients or health control studies are warranted to validate conclusions. Third, there can be many technical artifacts such as skin preparation, recording electrode asymmetry and inadequate stimulation. As peak latency can be influenced by electrode position and the time constant of EMG integration, the measurement of peak latency should be interpreted with caution. In the present case, the variations in onset latency could be latency jitter, because the individual peaks occurred at different points in time, possibly resulting in amplitude variation on the left side[3, 4]. As the EMG time constant or the degree of smoothing can affect the peak latency[6], we recommend the interpretation of peak latency of blink reflex to be limited to a comparison of the two sides or to an additional measure of onset latency.

## Conclusion

We report a rare case of trigeminal neuralgia, with a small mass in the Meckel's cave, showing delayed peak latency in the blink reflex of the affected side. The present case suggests the peak latency measurement of the blink reflex might be a valuable aid for discerning the presence of a small compressive element in patients with trigeminal neuralgia who are referred for MR imaging.

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## REFERENCES


1. *Majoie CB, Aramideh M, Hulsmans FJ, Castelijns JA, van Beek EJ, Ongerboer de Visser BW.* Correlation between electromyographic reflex and MR imaging examinations of the trigeminal nerve. Am J Neuroradiol 1999; 20:1119-25.
2. *Oh SJ.* Clinical Electromyography nerve conduction studies. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2003.
3. *Blumenthal TD, Cuthbert BN, Filion DL, Hackley S, Lipp OV, van Boxtel A.* Committee report: Guidelines for human startle eye blink electromyographic studies. Psycho-physiology 2005;42:1-15. https://doi.org/10.1111/j.1469-8986.2005.00271.x
4. *Malhotra A, Tu L, Kalra VB, Wu X, Mian A, Mangla R, et al*. Neuroimaging of Meckel's cave in normal and disease conditions. Insights Imaging 2018;9:499-510.
5. *Medvedeva LA, Syrovegin AV, Avakian GN, Gnezdilov AV, Zagorul'ko OI.* The methodology on the study of blink reflex and its normative parameters. Zh Nevrol Psikhiatr Im S S Korsakova 2011;111:62-7.
6. *Croutch KL, Wong WH, Coufal F, Georgy B, Hesselink JR*. En plaque meningioma of the basilar meninges and Meckel's cave: MR appearance. AJNR Am J Neuroradiol 1995;16:949-51.
7. *Yu E, de Tilly LN.* Amyloidoma of Meckel's cave: a rare cause of trigeminal neuralgia. Am J Roentgenol 2004;182: 1605-6. https://doi.org/10.2214/ajr.182.6.1821605
8. *Kapila A, Steinbaum S, Chakeres DW*. Meckel's cave epidermoid with trigeminal neuralgia: CT findings. J Comput Assist Tomogr 1984;8:1172-4. https://doi.org/10.1097/00004728-198412000-00027
9. *Mehta DS, Malik GB, Dar J*. Trigeminal neuralgia due to cholesteatoma of Meckel's cave. Case report. J Neurosurg 1971;34:572-4. https://doi.org/10.3171/jns.1971.34.4.0572
10. *Yamazaki Y, Ochi K, Nakata Y, Dohi E, Eguchi K, Yamaguchi S, et al.* Trigeminal neuropathy from perineural spread of an amyloidoma detected by blink reflex and thin-slice magnetic resonance imaging. Muscle Nerve 2010; 41:875-8. https://doi.org/10.1002/mus.21608
11. *Chmielewska B, Kamiński LM*. Progression of pre-existing trigeminalgia to Tolose-Hunt-like syndrome. The importance of neuroimaging for early differential diagnosis. Neurol Sci 2003;24:281-5. https://doi.org/10.1007/s10072-003-0157-4
12. *Rubin D, Dimberg EL, Kennelly KD.* The effect of paired stimuli on blink reflex latencies in normal subjects. Muscle Nerve 2011;44:235-40. https://doi.org/10.1002/mus.22034