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# Cutaneous-Evoked Tinnitus: First Reported Case Without Preceding Posterior Fossa Surgery

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**Abstract:** This is the first report of cutaneous-evoked tinnitus in the absence of posterior fossa surgery. A 56-year-old physician described brief bursts of clicking tinnitus in the right ear in response to rubbing a tiny area over the spine of the right scapula. He had cervical spondylosis and mild, stable, high-frequency, right-sided sensorineural hearing loss. Similarities to somatosensory *Mitempfindung* suggest that the condition may not be uncommon.

**Key Words:** cutaneous-evoked; *Mitempfindung*; tinnitus

Cutaneous-evoked tinnitus is a condition in which pressing on or stroking a particular area causes a noise in the ear on the same side. All three cases we identified from a search of MEDLINE and EMBASE occurred after posterior fossa surgery, whereas the case that we describe herein was associated with mild cervical radiculopathy but without any neurosurgical intervention. There are similarities to gaze-evoked tinnitus, for which most reported cases occur after posterior fossa surgery. However, our case bears similarities also to the commonly recognized benign condition of *Mitempfindung*, or “referred itch.”

## CASE REPORT

A 56-year-old physician without background tinnitus noticed a noise in his ear when drying his back. He found that pressing on or rubbing an area smaller than 1 cm in diameter lying over the medial third of the spine of the right scapula caused a high-pitched clicking noise in the ipsilateral ear. With steady pressure, the stream of clicks spread further apart and ceased over the course of approximately 3 seconds. Increased pressure with local movement caused the clicks to summate in a louder decrescendo pattern of similar duration. The

condition has remained stable for more than 2 years. Investigations have revealed an asymmetrical, high-pitched sensorineural hearing loss of 20 dB at 4 kHz and 40 dB at 8 kHz in the affected ear (a finding similar to one obtained a decade earlier when results of a magnetic resonance imaging [MRI] scan of the internal auditory meatus was normal). The pitch of the clicks was estimated at approximately 6 kHz by matching the sound. There was no auditory response to local vibration or to cold, cold–pain, hot, or hot–pain stimuli applied with a 3 × 4–cm pad. Pressure and stroking applied by the examiner or subject were equally effective. Neurological examination and MRI of the cervical spine revealed evidence of bilateral C6 spinal nerve root irritation.

## DISCUSSION

Only three cases of cutaneous-evoked tinnitus are found in the literature, and all were associated with ipsilateral posterior fossa surgery (excision of acoustic neuroma in two cases and massive paraganglioma in one) and hearing loss [1,2]. Our case is unique in the literature in that there was no previous neurosurgical intervention, although there was moderately severe cervical spondylosis with sensory symptoms in the hands, normal nerve conduction study results in the upper limbs, and evidence of bilateral C6 irritation.

Ipsilateral tinnitus has been reported variously in response to stroking the back of the right wrist [1], touching any of the fingertips of the right hand [1], and non-sexual genital stimulation [2]. In our case, the stimulus area over the spine of the right scapula was 2–3 mm in diameter, though a more deforming pressure was effective

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over an area of approximately 1 cm in diameter. This stimulus area seems to be smaller than that in previously reported cases.

The response to cutaneous stimulation was ipsilateral and was reported differently in each prior case as “tonal,” “zinging,” and a “high-pitched non-pulsatile hum” [1,2]. In our case, the tinnitus was described as “clicking.” The frequency of clicks increased with the pressure applied to the skin, becoming louder as the clicks summated and decaying away in click frequency over approximately 3 seconds.

In one case, functional MRI was able to demonstrate a contralateral temporoparietal cortical response involving the superior portion of the Sylvian fissure and inferior aspect of the parietal operculum [1]. In two of the three previously reported cases, cutaneous-evoked tinnitus was preceded by the development of gaze-evoked tinnitus in the deaf ear after posterior fossa surgery [1,2]. Tinnitus evoked by gaze even a few degrees away from the midline axis in any direction is well recognized and has been reported primarily after surgery for acoustic neuroma [3,4]. The tinnitus is usually maintained for as long as the gaze but in some cases is brief. Tinnitus has also been reported in response to other motor activity, such as neck movement [4,5]. Cutaneous-evoked tinnitus is a distinct condition in that motor activity is not required, and an examiner can provide the cutaneous stimulus.

There are intriguing similarities between cutaneous-evoked tinnitus and *Mitempfindung*. This is particularly so with our case. *Mitempfindung* is a common condition in which scratching one point on the skin is felt not only locally but as a more intense sensation or pain at a small, fixed site elsewhere on the same side of the body [6,7]. Just as in our case, the stimulus area is precise and usually only a few millimeters in diameter, and the somatosensory response is brief or momentary [7]. The response is sometimes described also as pins and needles, which may be analogous to the clicking nature of the tinnitus in our case. *Mitempfindung* is not well un-

derstood but is thought perhaps to be due to the misdirection of nerve fibers in the spinothalamic tract [6]. It is tempting to speculate that in our case, the clicks may represent the nerve impulses discharged by a single dermal pressure receptor.

The features of *Mitempfindung* were described by Stephen Hales of blood pressure fame in 1733 and by Müller in 1844 [6]. The phenomenon is sufficiently common that some physicians have described their own referred sensations, and it has been suggested that one in five healthy individuals may be affected [7].

## CONCLUSION

Given the similarities of our case with *Mitempfindung*, we speculate that cutaneous-evoked tinnitus in the absence of posterior fossa neurosurgery may be much more common than our first report would suggest.

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