Clear Effect of Mirror Therapy on Trigeminal Neuralgia

Pain

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Abstract

Introduction: Trigeminal neuralgia (TN) is one of the most excruciating pain conditions. Mirror therapy (MT) is effective in several chronic pain conditions and with a reversing set-up has been described as effective for facial pain with ongoing benefit five years later.

Case presentation: a middle-aged lady was offered MT for her long-standing TN. She experienced pain relief repeatedly and reliably after 10 minutes of massage applied by others and subsequently also on self-application of the massage. However, after several self-applications, which entailed significant strain of the massaging arm, MT suddenly and completely ceased to show effect.

Discussion: The significant and on occasions complete pain relief, albeit only temporary, with no side effects experienced, is promising. Whether the reported pain relief is reproducible in further patients, and whether a spoilt illusion can be restored, needs to be investigated.

Conclusion: The reliable pain reduction seen here suggests further use of MT for TN. The benefit of the illusion appears to have been lost through the strain or the vision of the self-administering arm on the pain-free side of the mirror reflection. Therefore self-administration should be avoided. If this treatment proves effective, a breakthrough in pain relief for chronic unilateral facial pain may be achieved.

Keywords
laterality, mirror therapy, mirror visual feedback, pain relief, syringomyelia, trigeminal neuralgia

Introduction

Trigeminal neuralgia is one of the most excruciating pain conditions and the most common neural malady (1). It is often associated with nerve compression, nerve degeneration or sympathetic encountered in syringomyelia, a central spinal cord syndrome caused by a slowly progressing flute-shaped cavity within the spinal cord(6).

Medication used are antiepileptics such as Phenytoin, Carbamazepine (CBZ), Oxcarbazepine (OXC), sometimes complemented with Lamotrigine, or Baclofen (7). Side effects of CBZ and OXC such as sedation, dizziness and gait abnormalities occur frequently, and hyponatremia is a serious risk, for which sodium levels need to be monitored. The dosage is limited by the tolerance of side effects. Lamotrigine is better tolerated but prone to cause skin reactions (7). Surgical procedures bear their own risks.

Mirror therapy has been found effective for the treatment of pain in phantom limbs and complex regional pain syndrome (8-12) with a mirror between the limbs; the

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patient can then see the intact limb and the reflection of it in a place where the affected limb could be.

Pain relief through mirror therapy has been well described in the literature over the past 20 years. The neuroscientific mechanisms at work, however, are still subject to much debate. Imaging studies have shown a correlation of cortical changes in relation to pain (13) and a reversal of these changes when phantom limb pain was reduced. The motor cortex, the sensory cortex, and the premotor cortex are involved in these changes (14). Reactivation of the representation area of the affected limb in the sensorimotor cortex has been shown in fMRI studies to correlate with pain reduction after mirror therapy in phantom pain (15) and in plexus avulsion (14). Reversal of dysfunctional cortical changes was reported after mirror therapy (16).

Other theories on pain resolution in phantom limbs with mirror therapy are, for example, the mismatch of motor commands with visual and proprioceptive signals overcome with a matching visual input (12, 17), or pain memory replaced by perfect visual input (12).

Mirror therapy has also been described as useful in a reversed (or double-reflecting) set-up, and was effective in TN (12 p 1706). Ramachandran and Altschuler referred to Beth Taylor-Schott who had successfully treated her husband’s Anaesthesia Dolorosa pain (a sub-group of TN where the nerve is dissected and pain is experienced in the numb area) with this procedure, weaning him off 3,200mg of Gabapentin completely with ongoing benefit five years later (18, 19). This was confirmed in several personal email communications between the author and Beth Taylor-Schott.

Case presentation

A middle-aged lady presented for physiotherapy related to whiplash after a recent car accident. She also complained about long-standing TN on her right side involving the auriculotemporal nerve and the zygomaticofacial area near the ear, and the masseter. The pain was experienced on a daily basis lasting from 1 to 5 hours. On the McGill Pain Questionnaire (20) the pain was described as beating or shooting and hot, and after the pain, exhausting. The pattern was rhythmic, intermittent, and ranged between mild and excruciating. A trigger for the pain was heat, whereas sleep and rest alleviated the pain. The only pain medication used was Carbamazepine and it was taken as needed, which differs from the original recommendation.

The evidence was passed on and explained to the patient and she volunteered for a free MT add-on to the whiplash treatment.

When the presence of the pain next coincided with an appointment at the practice, two mirrors of 35x45cm with smoothed edges, taped at the back of the interface of the long sides, were placed on the desk in front of the seated patient at an angle of slightly less than 90 degrees, so that the patient could see her reversed mirror images slightly to the right and to the left of the mirror-junction (see fig 1). Given that there are no obvious unilateral marks in the face or hair, the image resembles the usual mirror image of one’s own face, and it can only be recognised as side-reversed with movement or other clues entering the scene. That there were two images either side of the junction did not disturb the patient, as they were identical.
Results

On the Numeric Rating Scale (NRS), with 0 being no pain and 10 being the worst imaginable pain \(^{(21, 22)}\), the baseline pain before the first treatment was 5/10, burning and tingling. Touch and massage was applied to the patient’s left (unaffected) cheek whilst she was sitting still and watching the procedure in the reversed mirror set-up. After 7 minutes of massaging (as shown in figure 2) she reported a quick sharp pain in her right masseter and she wanted the massage to continue. When prompted to choose between touch, moving skin and massaging the masseter, she indicated massaging the masseter muscle as the best procedure. After 10 minutes and another quick sharp pain, the pain started to decrease and was reduced to 2.5/10 after 15 minutes. She reported this to have been a “very weird” experience; she had never thought looking in a mirror could have any effect on her pain. Interestingly, during the following whiplash treatment she positioned herself on her bad side and was unaware of this all through the treatment, much to her later amazement when recalling this. The TN pain continued to decrease to 2/10.

She took the mirrors home and instructed her husband who applied the massage during three pain exacerbations whilst she was watching the reversed mirror reflection. This reduced the pain from 8 to 2 each time. It always took 10 minutes to
start to show effect and the effect lasted for about one week each time, which was an immense improvement after having experienced daily pain exacerbations previous to the intervention.

To be independent from her husband, she applied the massage with her left hand herself which showed the same effect reliably: each time it took 10 minutes of massaging to initiate the pain decrease which then reliably reduced the pain from high scores to 2/10 or 0/10. The effect, however, did not last for a full week. In addition, massaging her own face for such a long time (about 15-20 minutes) strained her left arm.

Remarkably, for a very intense 10/10 flare-up she massaged her left cheek for 15 minutes before the pain started to decrease and, after a 15 min break to relax her arm, she continued to massage for another 10 minutes which reduced the pain to zero for the night. On waking the following morning, the pain was only 1/10 but returned within 15 minutes, peaking at 10/10. Subsequently, she applied another 15 min session which reduced the pain to zero and she stayed pain-free all day.

However, after more than 7 weeks of consistently successful mirror therapy, during which time she took Carbamazepine only on very rare occasions, the intervention suddenly ceased to be effective. The pain level could not be changed, no matter how long she massaged and watched, and also massage applied by her husband did not show any effect at all. The pain reappeared as it had been before the intervention was started, with similar severity but reduced frequency (only 3-4 times a week as opposed to every day before the intervention). She took Carbamazepine again accordingly as needed. Two years later the pain suddenly increased and spread, and MRI investigations revealed syringomyelia.

The patient never experienced any side effects from MT other than the two quick sharp pains in the affected masseter muscle during the first session. No alterations to the mirror setting have been tried so far.

**Discussion**

It is striking that the pain reduction occurred reliably and repeatedly, and always initiated the reduction after 10 minutes of massaging. Given the fact that trigeminal neuralgia is often a condition of excruciating pain with no easy treatment, this variation of MT is well worth following up. It did not cause side effects or pain increase (apart from the two sharp pain sensations in the affected masseter muscle during the first treatment) and only requires a partner, two mirrors and about 15 minutes time when needed. If this mechanism of pain relief proves transferable to a larger sample and to other pain conditions sensible to touch or tissue pressure, a breakthrough in pain therapy would be achieved.

The fact that the patient lay on her bad side after the first treatment without realising raises the question of whether her laterality judgement ability had been affected through the intervention. As the pain decreased during this time, correct laterality perception does not seem to be a prerequisite for successful pain treatment. The fact that the procedure ceased to show effect, suddenly and completely, after repeated self-administration of the massage, suggests that the brain had discovered the illusion into which it had been tricked, i.e., the side being touched is not the side of the pain.
There are three possible causes for the termination of the pain-relieving effect on self-administration of the massage:

1. During self-application, the patient’s left, massaging arm was reflected as being the right arm, whilst in the peripheral visual field of the patient it was seen as the left arm. This conflicting moving visual clue (the arm) might have spoilt the illusion.

2. The patient complained about the left arm being strained during about 15-20 minutes of massaging. This involved tension in the left trapezoid muscle on the neck with likely overflow to other neck and head muscles, e.g., the sternocleidomastoid muscle and the platysma, and possibly even involving the masseter which was massaged. Proprioceptive feedback from these muscles may have sent augmented laterality information to the brain, causing a detangling of the illusion.

3. On self-application, a slight shift of position of the head might have occurred unrecognised. A position shift spoils the illusion, as the side to which the head shifts or tilts in a reversed mirror set-up is contralateral to the one expected in a mirror reflection.

To the author’s knowledge, none of these hypotheses has been researched yet. Studies on metacognition of agency (23) have been conducted, rubber hands are well known to be able to be integrated in one’s own body scheme when seen as being touched whilst feeling the own, hidden hand being touched synchronously (24), even with mismatch of instruments of stimulation and blindfolded (25), but not with incongruent objects of stimulation (dish brush and finger) (26). As the object of stimulation (the cheek) was of the same ‘felt and seen’ nature (though not on the same side), it could be implied that self-administration might be effective, as it was on the first few occasions. Other researchers observed activation in the frontoparietal network during self-attribution of observed movement combined with visual mismatch (27), which might also have been the case in our patient. However, there seems to be no research to date using a reversed mirror set-up investigating the influence of laterality and transcallosal innervation. In stroke, mirror therapy proved successful in a patient with callosal disconnection (28). It would be interesting to try whether the illusion could be restored by laterality training as described by Moseley with hand recognition flash cards (29) or with retraining through intense facial grooming with a normal mirror. If it is possible to unlearn a spoilt illusion, then further benefit might be gained with MT.

The patient’s pain medication (carbamazepine) causes tiredness and thus affects her quality of life. Mirror Therapy using a reversed mirror image did not cause any side effects in her or in Beth Taylor-Schott’s husband. During the time when the mirror intervention was effective, she only took Carbamazepine on very few occasions.

The patient confirms that the pain has definitely become less frequent and not worse in intensity or duration after the mirror intervention during the following two years before the pain spread and syringomyelia was detected. It is therefore ethically justifiable to continue further use in practice and research when the massage is applied by someone else. However, self-administration of the massage should be avoided as this appears to have caused the ceasing of the effect.
This case study includes reports given by the patient. Therefore bias is acknowledged. It may be stated that this patient has demonstrated reliability over several years, is not prone to self-delusion from the author’s perspective, and reconfirms the facts on at least two occasions.

Conclusion

Mirror Therapy has shown to be reliably effective for TN pain when the massage was administered by a second person. It suddenly ceased to show effect after several successful self-administrations. It is assumed that the visual illusion had been spoilt by the strain on the administering arm on the same side. Therefore, self-administration should not be performed. In general, the use of two mirrors, taped on the long sides and moved towards each other’s reflecting side, seems promising in alleviating unilateral facial pain and should be further researched.

Written consent from the patient to use the data with a pseudonym for academic and teaching purposes was obtained. Notes about the development in the patient’s condition were recorded during further physiotherapy sessions, and additionally in telephone and face-to-face follow-up conversations. The author takes full responsibility for the content of the case study. There is no conflict of interest. Permission to use the notes for this article was given in writing by the patient. The study received no funding.

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References


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