

## PHANTOM PAIN

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### Summary

Phantom pain is one of the most puzzling problems in the study and treatment of pain. In this article the possible mechanisms responsible for the etiology, pathogenesis and clinical manifestations are discussed. The origin of phantom pain is not only traumatic but it could also be genetic and inborn. Several mechanisms are already described but it is still not absolutely clear why in some cases after a particular trauma, phantom pain appears, and not in others. A similar question arises as to why phantom limb pain and stump pain appear. The treatment of phantom pain is therefore also very difficult and results are very individual. Both non-invasive (pharmacological and psychological) and invasive (neurosurgical) methods of treatment are described. Phantom pain and its treatment and recovery is a very good example of the plasticity of the brain and the possibility of functional recovery is one of the hopes not only for relief of the pain but also for treatment of neurological and psychiatric disorders in general.

### 1. Introduction

*Phantom pain* is still one of the key puzzles regarding pain at the beginning of the twenty-first century. The word ‘phantom’ has several meanings. It is very familiar through ‘Phantom of Opera’—a very successful romance and musical stage show about an unknown phantom living in the Paris Opera. Generally speaking a phantom is something that we are feeling and which has no real background. In the medical sense we use the expression ‘phantom’ for non-existent parts of the body which are already memorized or represented in our brain, for example amputee extremities, that are still

perceived as in normal life. Phantom parts of the body have existed, but for some reason they have been removed. It primarily concerns extremities lost as a result of different types of injuries and diseases (e.g. diabetic leg, gangrene, war injuries, etc.). But there are not only phantom limbs but also phantom breasts and uterus in women, and penis in man. It can also involve other parts of the trunk or the face.

After removing these parts of the body the patient still feels them, and the sensations they feel are generally not pleasant. Their most unpleasant feature is pain. All sensations can arise from an amputee, i.e. not only pain but also heat, cold, touch, and their lengths and movements. Phantom pain is a very frequent phenomenon after an amputation. Approximately 70% of people feel pain in phantom limbs or other parts of the body after an amputation, taking together all parts of the body, age, gender and sex. It is also possible to suffer from phantom pain after the amputation of part of the chest, visceral organs, eyes or teeth.

The first mention of phantom pain was in the sixteenth century (1551) by the French war surgeon Amroise Paré, who described phantom pain after amputation—his patients were still complaining about the pain in the lost parts of the body. This phenomenon was very common also in the literature because many writers had personal experience with amputation. e.g. René Descartes, Herman Melville and Hans Christian Andersen. The first descriptions of phantom pain were by F. Magandie (1833), Rhône (1842), H. Guiénot (1861) and Weir Mitchell (1872).

Mitchell used the expression “non visible extremity”. Whitacker (1979) was probably the first person to use the term ‘phantom limb’. This is a natural and acceptable consequence of the amputation, which generally has no therapeutic problems. But a phantom limb is sometimes the source of very severe and intractable pain, and hence a major obstacle to successful rehabilitation. It is necessary to distinguish between the *phantom limb* and *phantom pain*. In *phantom limb* we have different sensations in the lost part of the body, but excluding pain. In *phantom pain*, a pain sensation seems to come from a phantom limb. Other phantom experiences might not be painful. For example after amputation of the penis, a patient can still feel an erection—a *phantom sensation*. Also, phantom menstruation is felt after hysterectomy, when women continue to have menstrual symptoms.

Phantom limb pain is experienced by 2 to 97% of the operated individuals. In 60% to 85% of operated individuals it occurs as intractable pain. This pain is probably more frequent in people with lower socio-economic status and in patients with very early complications during the postoperative period. Phantom pain is also more frequent if the amputation site is situated more proximally.

The terms are distinguished as follows:

- *Phantom sensations*: non-painful sensations realized in the non-existing extremity.
- *Phantom pain*: painful (nociceptive) sensations connected with an amputated part of the body.
- *Stump pain*: pain localized in the amputated stump and influenced by local pathological states like ischemia and neurinoma.

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**Anna Yamamotová**, PhD, Associate Professor of Physiology was born in 1953 in Trenčín, Czechoslovakia. She obtained the following degrees: 1984 RNDr., Charles University, Prague; 1984 CSc. Czechoslovak Academy of Sciences, Prague; 2003 Doc. (Associate Professor of Physiology) Charles University Prague. She graduated in the Biological Faculty of Lomonosov University, Department of Physiology of Higher Nervous Activity, Moscow. Diploma dissertation work: "The conditioned motor reaction during the different stages of human sleep and its electrophysiological correlates". Then she worked in the Psychiatric Research Institute, Prague, where she defended a dissertation on the theme: "The study of the activation dynamics from the point of view of electrophysiological correlates of behaviour in laboratory rat". Her research interest was "Biological rhythm and activation dynamics in normal and pathological behaviour". From 1985 to 1993 she was working in the Institute of Physiological Regulations of the Czech Academy of Sciences. In 1990 she was visiting scientist in the Affective Disorder Team (under Prof. P. Grof) in Royal Ottawa Hospital, Ottawa, Canada. From 1993 to the present she was Assistant Professor and Associate Professor at the Department of Physiology and Clinical Physiology, 3rd Faculty of Medicine, Charles University, Prague. Her present interest is: common neurobiological mechanisms of pain, stress and food intake.