Causes, diagnosis and treatment of visceral hallucinations

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Visceral hallucinations are unpleasant sensations that appear to arise from internal organs, and can occur in both psychiatric and neurological disorders. Here, Dr Kathirvel and Professor Mortimer discuss the differential diagnosis, pathophysiology and treatment of visceral hallucinations.

Hallucinations of bodily sensations are classified into external bodily hallucinations, tactile hallucinations, kinaesthetic hallucinations and internal, visceral hallucinations (see Table 1). The term somaesthetic hallucination is used to refer to a hallucinatory experience in one or several of the sensory modalities mentioned above.

Hallucinations of bodily sensations are relatively infrequent and sometimes pose phenomenological challenges in clinical practice. In this article, we review the phenomenology, diagnostic implications, putative pathophysiology and treatment of visceral hallucinations.

**Phenomenology**

Visceral sensations arise from internal organs, are poorly localised and more likely to be unpleasant. They are represented in the secondary sensory cortex and poorly localised in the brainstem region.

**Figure 1.** Anatomical components of the ‘pain matrix’: visceral pain is thought to elicit more response from within the medial nociceptive system. Reproduced with permission from Jones AKP, Kulkarni B, Derbyshire SWG, et al. Pain mechanisms and their disorders: Imaging in clinical neuroscience. Br Med Bull 2003;65:83-93
Visceral hallucinations may present as pain, heaviness, stretching or distension, palpitation, etc.\textsuperscript{5} Schizophrenic visceral sensations are varied, but lack the superficial nature of external bodily (tactile) hallucinations, for instance: ‘There is a tearing feeling in his head and in his back, a burning in his stomach, pain in his teeth, a rolling in his brain, a tugging at his heart…’\textsuperscript{5}

Although this article focuses primarily on visceral hallucinations we will also briefly mention external bodily hallucinations. External bodily sensations are superficial sensations, such as touch, temperature and proprioception. These sensations are well localised and represented in the primary somatosensory cortex.\textsuperscript{3} External bodily hallucinations are usually varied, for instance: ‘The patient feels himself laid hold of, touched over his whole body, he feels tickling in his thigh and right up to his neck, pricking in his back and in his calves, a curious feeling in his neck, heat in face; hot sand is strewn over his face; filth is put in his hair…’\textsuperscript{5}

Formication is a type of tactile hallucination in which the individual experiences the sensation of insects crawling over or under the skin. In Ekbom’s syndrome – delusions of infestation – the individual may report a tactile hallucinatory experience.\textsuperscript{1}

Differences in cortical localisation possibly reflect the different pattern of tactile and visceral input to the cerebral cortex. There are also differences in the cortical processing of tactile and visceral sensations, which account for the perceptual differences observed between the two sensory modalities.\textsuperscript{3}

The other phenomenological difference between tactile and visceral hallucinations is that visceral hallucinations are not verifiable. When the patient describes visceral hallucinations there is no external referent, ie ‘there is nothing for the physician to see’.\textsuperscript{6} On the other hand, tactile hallucinatory modalities may be verified or otherwise, ie one can see whether there is a touch or not.\textsuperscript{7}

**Differential diagnosis**

Visceral hallucinations occur in both psychiatric and organic disorders, particularly neurological disorders.

**Psychiatric disorders**

Visceral hallucinations can occur in schizophrenia although it is less common than other types of hallucinations in this condition. As mentioned earlier, schizophrenic visceral sensations are limitless and are usually described by the patient in a bizarre way. Visceral sensations can also manifest as delusional infestation. In this condition, the patient believes that there is an animal inside their body; for example, a wasp wandering around inside them.\textsuperscript{5}

Transient epigastric hallucinations, which typically manifest as rising upper abdominal sensations, can occur in bipolar disorder and unipolar major depressive disorder.\textsuperscript{8}

**Neurological disorders**

Visceral sensations, commonly epigastric sensations known as ‘epigastric aura’, occur in the aura of temporal lobe epilepsy (complex partial seizures). These are vague rising sensations from the epigastrium towards the throat, and may be described as churning or pain in the stomach.\textsuperscript{9} Epigastric hallucinations also occur during ictal and interictal periods although they are much more common during a seizures episode.\textsuperscript{8}

Visceral sensory hallucinations have been described in limbic epilepsy involving insular lesions. In one patient, the seizures started with a feeling of ‘butterflies in his throat’ followed by motor automatisms.\textsuperscript{10} Visceral sensations involving the throat, epigastrium and abdomen also occur in insular ictal phenomena.\textsuperscript{10} Parkinson’s disease may present with visceral hallucinations secondary to antiparkinsonian medications. One patient developed cenesthetic hallucinations (that refer to somatic hallucinations of visceral origin) during pergolide and levodopa treatment. She felt as if her bowels and bladder extruded from the distal parts of her upper limbs. She scratched her arms in order to avoid these extrusions.\textsuperscript{11}

Visceral hallucinations may also occur in multiple sclerosis and thalamic pain syndrome.\textsuperscript{12}

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Superficial</strong></td>
<td>an abnormal perception of heat and cold</td>
<td>‘my feet are on fire’</td>
</tr>
<tr>
<td>thermic</td>
<td>sensation of touch</td>
<td>‘a dead hand touched me’, formication</td>
</tr>
<tr>
<td>haptic</td>
<td>a perception of fluid</td>
<td>‘I can feel water running on my chest’</td>
</tr>
<tr>
<td>hygric</td>
<td>hallucinations felt in muscles and joints</td>
<td>subjects report that they ‘feel their muscles are being squeezed’</td>
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<tr>
<td><strong>Kinaesthetic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visceral</td>
<td>hallucinations of inner organs</td>
<td>pain, stretching, heaviness, etc</td>
</tr>
</tbody>
</table>

**Table 1. Types of hallucinations of bodily sensation**

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Pathophysiology

Functional neuroimaging techniques have been employed to understand the pathophysiology of hallucinations. These techniques include positron emission tomography (PET), single photon emission computed tomography (SPECT) and functional magnetic resonance imaging (fMRI). These techniques are often used to detect changes in regional cerebral blood flow (rCBF) in certain forms of PET and SPECT, and changes in blood oxygen level-dependent (BOLD) response in fMRI. However, PET and SPECT techniques may also be used to measure regional brain metabolism and neurotransmitter receptor binding.

Hallucinations are associated with sensory modality-specific activation in cerebral areas involved in normal sensory processing. This finding has been well studied in auditory and visual hallucinations. During auditory and visual hallucinations, there is increased brain activity in the regions specific to the sensory modality of the hallucination as well as dysfunction in the connections between different brain regions. Also, functional neuroimaging studies have revealed that in auditory and visual hallucinations primarily, there is hyperactivation in the secondary sensory cortex. Dysfunction in prefrontal premotor, cingulate, subcortical and cerebellar regions has also been observed in the hallucinatory experiences.

However, there are only limited studies investigating the neural correlates of visceral and tactile hallucinations. An fMRI study of a young man with schizophrenia experiencing tactile hallucinations during which he was ‘touched by spirits’ showed an association with activation of corresponding primary somatosensory and posterior parietal cortices. Another study of a similar case using EEG, showed findings consistent with the fMRI study. The activation of somatosensory cortices corresponded with that of the patients’ phenomenological experience of being touched by spirits.

An MRI scan of an elderly man with delusional parasitosis, who felt worms moving around in his mouth, revealed an old infarction of the right putamen and his symptoms responded to treatment with pimozide. A SPECT scan, before and after responding to clomipramine, of an elderly woman who believed ‘something was moving in her abdomen’, revealed hypoperfusion of the left temporoparietal cortices at the height of her symptoms.

It has been suggested that somatic and visceral pain is distinct qualitatively and has different neural
correlates in that somatic pain elicits more response from within the lateral system of the pain matrix, which incorporates lateral thalamic nuclei, insula and secondary somatosensory cortices (concerned with pain localisation), and visceral pain from the medial system, which incorporates the midline and intra-laminar thalamic nuclei (MITN), amygdala and anterior cingular cortex (more concerned with its affective significance) (see Figure 1).

In general, visceral pain evokes greater unpleasantness than somatic pain. Visceral pain elicits immobilisation, while somatic pain is more likely to precipitate a ‘flight-flight’ response. Therefore, there is a greater involvement of motor regions in its cerebral representation. Visceral pain is likely to be harder to localise.

The recent developments in the neurobiology of pain – visceral and somatic – may help us to understand the underlying possible neurobiological mechanisms of visceral hallucinations.

**Treatment**

Treatment of visceral hallucinations would depend on the underlying syndrome or disorder. Much of what is thought to be functional in this regard may well, given sophisticated neuroimaging investigations, prove actually to have organic correlates. Thorough clinical evaluation of someone presenting with visceral hallucination is important to be able to differentiate the likely aetiology and provide appropriate treatment. For example, visceral hallucinations occurring in schizophrenia may respond to antipsychotics drugs, but in epilepsy these hallucinations require, primarily, treatment with anticonvulsants.

**Conclusion**

The phenomenology of visceral hallucinations does not readily fit in with the conventional definition of hallucinations, in that they are not verifiable, unlike hallucinations of other sensory (auditory, visual and tactile) modalities, whose reality can be refuted by an observer.

Visceral hallucinations have a varied aetiology encompassing both functional and organic disorders, although specialist neuroimaging may demonstrate associated anomalies in cerebral neurophysiology. When assessing someone presenting with visceral hallucinations, the possibility of organic aetiopathology should be borne in mind in order to inform effective treatment. Further neuroimaging studies are required to understand the neural correlates of visceral hallucinations.

**Declaration of interests**

None declared.

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**References**