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A REVIEW ON ALIEN HAND SYNDROME

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ABSTRACT

Alien hand syndrome is a rare neurological disorder in which one hand functions involuntarily, Alien hand syndrome is defined as an uncontrollable, but purposeful movements. The first known case described in the medical literature appeared in a detailed case report published in German in 1908 by the preeminent German neuro-psychiatrist, Kurt Goldstein. Alien hand syndrome is best documented in cases where a person has had the two hemispheres of their brain surgically separated, a procedure sometimes used to relieve the symptoms of extreme cases of epilepsy. It also occurs in some cases after brain surgery, stroke, infection, tumor, aneurysm and specific degenerative brain conditions such as Alzheimer's disease and Creutzfeldt– Jakob disease. Other areas of the brain that are associated with alien hand syndrome are the frontal, occipital and parietal.

K**eywords:** Alien hand syndrome, Neurological disorder.

INTRODUCTION

Alien hand syndrome, (AHS) is a rare neurological disorder that causes hand movement without the person being aware. Alien hand syndrome is defined as an uncontrollable, but purposeful movements. Alien hand syndrome is best documented in cases where a person has had the two hemispheres of their brain surgically separated. a procedure sometimes used to relieve the symptoms of extreme cases of epilepsy.[1]

It also occurs in some cases after brain surgery, stroke, infection, tumor, aneurysm and specific degenerative brain conditions such as Alzheimer's disease. They are under the impression that it is being controlled by an external force. The name Alien Hand Syndrome was given by Joseph Bogen. It is sometimes called Dr. Strangelove syndrome based on the strange hand movements of the main character of the movie Dr. Strangelove. In the movie Dr Stragelove

had no control on his right hand and made strange movements like raising his black-gloved right hand into Nazi salutes or trying to throttle his own neck Bellows, Alien Hand Syndrome Damn Interesting. Retrieved October 6, 2011.[2]

CASE REPORT

- She had partially recovered by the time she was seen. However, her left arm seemed as though it belonged to another person and performed actions that appeared to occur independent of her will.
- The patient complained of a feeling of "strangeness" in relationship to the goal-directed movements of the left hand and insisted that "someone else" was moving the left hand, and that she was not moving it herself. Goldstein reported that, as a result of this report, "she was regarded at first as a paranoiac." When the left hand grasped an object, she could not voluntarily release it.
- The somatic sensibility of the left side was reported to be impaired, especially with aspects of sensation having to do with the orienting of the limb. Some spontaneous movements were noted to occur involving the left hand, such as wiping the face or rubbing the eyes; but these were relatively infrequent. Neurologic examination revealed normal cranial nerve, motor, and sensory function. The myostatic reflexes were normal. No pathological reflexes could be elicited. The sensory system was normal. Verbal fluency was markedly reduced, however, he could follow and cooperate with commands well. The Only with significant effort was she able to perform simple movements with the left arm in response to spoken command, but these movements were performed slowly and often incompletely even if these same movements had been involuntarily performed with relative ease before while in the abnormal 'alien' control mode.

HISTORICAL NOTE

- Alien hand syndrome is not consistently or precisely defined. It describes complex, goal-directed activity in one hand that is not voluntarily initiated.
- The patient is unable to explain the source of such movement and may consider the limb to move as if it had a mind of its own essentially, two kinds of behavior are covered by this term (Feinberg et al 1992).[3] The first consists of repetitive involuntary grasping.
- Beginning in 1900, Liepmann drew attention to the unilateral, disinhibited grasp reflex to tactile stimulation after cerebral injury (Liepmann 1905) [4], although this phenomenon had been described by Kaiser as early as 1897.
- Liepmann's detailed descriptions of disinhibited grasp reflex and unilateral apraxia quickly inspired other German investigators to contribute their own observations of acquired complex movement disorders.
- Among them, Van Vleuten reported a patient with a left hemisphere brain tumor that had invaded the corpus callosum (Van Vleuten 1907) [5].

- His patient complained, "There must be an evil spirit in the hand!" In succeeding years, such behavior became formally labeled by terms that included, "pseudo spontaneous movements", Nachgreifen ("after-grasping") (Schuster 1923)[6], "magnetic apraxia" (Denny-Brown 1958)[6], “manual grasping behavior” (Lhermitte 1983)[7], the "groping-grasping reaction" (Magnani et al 1987)[8] and “visual groping” (Yagiuchi et al 1987)[9] The second behavior covered by the term “alien hand syndrome” involves unilateral goal-directed limb movements that are contrary to the individual's intention and not accounted for by repetitious grasping or unilateral apraxia.
- In this case, the patient's left hand was not only apraxic, but also performed markedly incorrect actions, such as touching his right hand instead of his nose, despite his understanding the command, and failing to move when commanded and failing to move when commanded. Selfoppositional behavior, wherein one limb counteracts the declared or consciously intended action of the other limb, was often noted after complete or partial surgical division of the corpus callosum (callosotomy) to treat refractory epilepsy[10,11].

CLINICAL MANIFESTATIONS

Three kinds of alien hand are now recognized. In the first, termed “the frontal variant”, the patient has disinhibited groping, an unintended reaching out toward visible objects that fall within arm's reach (visual grasp) or that have been removed from contact with the hand. Self-directed grasping may also occur, which may even awaken the person from sleep[12-15]. Once seized, the patient has difficulty letting go of the object and may repeatedly clutch at the object when holding it. The behavior may even involve involuntary sexual self- or other-person-fondling that may publicly embarrass the patient. Paradoxically, the patient may have difficulty willing the limb to move. Patients sometimes describe an urge to move in this variant [16]. The grasp reflex to tactile stimulation is usually present, although some exceptions have been reported, and tone is increased in the limb. A tightening of the grip occurs the more that the patient attempts to release the object. With concentrated effort the patient can release the object; however, with distraction the phenomenon may be reinstated.

SYMPTOMS

- A person with alien hand syndrome can feel normal sensation in the hand and leg, but believes that the hand, while still being a part of their body, behaves in a manner that is totally distinct from the sufferer's normal behaviour.
- They feel that they have no control over the movements of the 'alien' hand but that, instead, the hand has the capability of acting autonomously—i.e., independent of their voluntary control.

- Alien behavior" can be distinguished from reflexive behavior in that the former is flexibly purposive while the latter is obligatory.
- They lose the 'sense of agency' associated with the purposeful movement of the limb while retaining a sense of 'ownership' of the limb.
- They feel that they have no control over the movements of the 'alien' hand, but that, instead, the hand has the capability of acting autonomously, i.e., independent of their voluntary control. The hand effectively has 'a will of its own.
- "Alien behavior" can be distinguished from reflexive behavior in that the former is flexibly purposive while the latter is obligatory.
- Sometimes the sufferer will not be aware of what the alien hand is doing until it is brought to his or her attention, or until the hand does something that draws their attention to its behavior.

SUB TYPES

There are several distinct subtypes of alien hand syndrome that appear to be associated with Specific distributions of associated brain injury.

Corpus callosum

Damage to the corpus callosum can give rise to "purposeful" actions in the sufferer's non-dominant hand (an individual who is left-hemisphere-dominant will experience the left hand becoming alien, and the right hand will turn alien in the person with right-hemisphere dominance)

In "the callosal variant", the patient's hand counteracts voluntary actions performed by the other good hand. Two phenomena that are often found in patients with callosal alien hand are agonistic dyspraxia and diagonistic dyspraxia.

Agonistic dyspraxia involves compulsive automatic execution of motor commands by one hand when the patient is asked to perform movements with the other hand.

- For example, when a patient with callosal damage was instructed to pull a chair forward, the affected hand would decisively and impulsively push the chair backwards.[17] Agonistic dyspraxia can thus be viewed as an involuntary competitive interaction between the two hands directed toward completion of a desired act in which the affected hand competes with the unaffected hand to complete a purposive act originally intended to be performed by the unaffected hand.
- Diagonistic dyspraxia, on the other hand, involves a conflict between the desired act in which the unaffected hand has been engaged and the interfering action of the affected hand.[18]

- In another case of callosal alien hand, the patient did not suffer from inter manual conflict between the hands but rather from a symptom characterized by involuntary mirror movements of the affected hand. 19 When the patient was asked to perform movements with one hand, the other hand would involuntarily perform a mirror image movement which continued even when the involuntary movement was brought to the attention of the patient, and the patient was asked to restrain the mirrored movement. The patient suffered from a ruptured aneurysm near the anterior cerebral artery, which resulted in the right hand being mirrored by the left hand. The patient described the left hand as frequently interfering and taking over anything the patient tried to do with the right hand. For instance, when trying to grasp a glass of water with the right hand with a right side approach, the left hand would involuntary reach out and grasp hold of the glass through a left side approach More recently, Geschwind et al.[20]

Frontal lobe

- Unilateral injury to the mesial aspect of the brain's frontal lobe can trigger reaching, grasping and other purposeful movements in the contralateral hand. With anteromedial frontal lobe injuries, these movements are often exploratory reaching movements in which external objects are frequently grasped and utilized functionally, without the simultaneous perception on the part of the patient that they are "in control" of these movements.[21]
- Goldberg and Bloom [22] described a woman who suffered a large cerebral infarction of the medial surface of the left frontal lobe in the territory of the left anterior cerebral artery which left her with the frontal variant of the alien hand involving the right hand. There were no signs of callosal disconnection nor was there evidence of any callosal damage. The patient displayed frequent grasp reflexes; her right hand would reach out and grab objects without releasing them. In regards to tonic grasping, the more the patient tried to let go of the object, the more the grip of the object tightened. With focused effort the patient was able to let go of the object, but if distracted, the behaviour would re-commence.
- The patient could also forcibly release the grasped object by peeling her fingers away from contact with the object using the intact lefthand. Additionally, the hand would scratch at the patient's leg to the extent that an orthotic device was required to prevent injury.[23] Another patient reported not only tonic grasping towards objects nearby, but the alien hand would take hold of the patient's penis and engage in public masturbation.[24]

EXPLANATORY THEROIES

The common emerging factor in alien hand syndrome is that the primary motor cortex controlling hand movement is isolated from Premotor cortex influences but remains generally intact in its ability to execute movements of the hand. A 2009 fMRI study looking at the temporal sequence of activation of components of a cortical network associated with voluntary movement in normal individuals demonstrated "an anterior-to-posterior temporal gradient of activity from supplemental motor area through premotor and motor cortices to the posterior parietal cortex".[25] Therefore, with normal voluntary movement, the emergent sense of agency appears to be associated with an orderly sequence of activation that develops initially in the anteromedial frontal cortex in the vicinity of the supplementary motor complex on the medial surface of the frontal aspect of the hemisphere (including the supplementary motor area) prior to activation of the primary motor cortex in the pre-central gyrus on the lateral aspect of the hemisphere, when hand movement is being generated. Activation of the primary motor cortex, presumed to be directly involved in the execution of the action via projections into the corticospinal component of the pyramidal tracts, is then followed by activation of the posterior parietal cortex, possibly related to the receipt of recurrent or re-afferent somatosensory feedback generated from the periphery by the movement which would normally interact with the efference copy transmitted from primary motor cortex to permit the movement to be recognized as self-generated rather than imposed by an external force. That is, the efference copy allows the recurrent afferent somatosensory flow from the periphery associated with the self-generated movement to be recognized as re-afference as distinct from exafference.

CAUSES

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Therefore, with normal voluntary movement, the emergent sense of agency appears to be associated with an orderly sequence of activation that develops initially in the anteromedial frontal cortex in the vicinity of the supplementary motor complex on the medial surface of the frontal aspect of the hemisphere (including the supplementary motor area prior to activation of the primary motor cortex in the pre-central gyrus on the lateral aspect of the hemisphere, when hand movement is being generated.[27]

Activation of the primary motor cortex presumed to be directly involved in the execution of the action via projections into the corticospinal component of the pyramidal tracts, is then followed by activation of the posterior parietal cortex possibly related to the receipt of recurrent or re-afferent somatosensory feedback generated from the periphery by the movement which would normally interact with the efferent copy transmitted from primary motor cortex to permit the movement to be recognized as self-generated rather than imposed by an external force.[28]

TREATMENT

There are no approved or recommended therapies for AHS, and its management is based on anecdotal reports of both pharmacologic and behavioral interventions. There are no approved or recommended therapies for AHS, and its management is based on anecdotal reports of both pharmacologic and behavioral interventions. A notable report is that of a 13-year-old female with right-arm levitation, after a left anterior thalamic infarction, who responded to clonazepam toxin. Two days after starting 1 mg of clonazepam daily, she had a 70% reduction in the number of levitations per minute.

Clonazepam possibly potentiated her thalamic GABAergic circuitry, which likely resulted in either reducing the arm's oversensitivity to external stimuli or dampened the internal stimulus driving the AHS. Clonazepam is a drug of neuromuscular blocking agent.

Neuromuscular-blocking drugs block neuromuscular transmission at the neuromuscular junction, causing paralysis of the affected skeletal muscles. This is accomplished either by acting presynaptically via the inhibition of acetylcholine (ACh) synthesis or release or by acting postsynaptically at the acetylcholine receptors of the motor nerve end-plate.[29]

Another method involves simultaneously "muffling" the action of the alien hand and limiting the sensory feedback coming back to the hand from environmental contact by placing it in a restrictive "cloak" such as a specialized soft foam hand orthosis or, alternatively, an everyday oven mitt. Other patients have reported using an orthotic device to restrict perseverative grasping or restraining the alien hand by securing it to the bed pole.[30] Of course, this can limit the degree to which the hand can participate in addressing functional goals for the patient and may be considered to be an unjustifiable restraint. Theoretically, this approach could slow down the process through which voluntary control of the hand is restored if the neuroplasticity that underlies recovery involves the recurrent exercise of voluntary will to control the actions of the hand in a functional context and the associated experiential reinforcement through successful willful suppression of the alien behavior.[31]

In another approach, the patient is trained to perform a specific task, such as moving the alien hand to contact a specific object or a highly salient environmental target, which is a movement that the patient

can learn to generate voluntarily through focused training in order to effectively override the alien behavior. It is possible that some of this training produces a reorganization of premotor systems within the damaged hemisphere, or, alternatively, that ipsilateral control of the limb from the intact hemisphere may be expanded.

When AHS originates from focal injury of acute onset, recovery usually occurs within a year.[32] One theory is that neuroplasticity in the bihemispheric and subcortical brain systems involved in voluntary movement production can serve to re-establish the connection between the executive production process and the internal self-generation and registration process. Exactly how this may occur is not well understood, but a process of gradual recovery from alien hand syndrome when the damage is confined to a single cerebral hemisphere has been reported.[33] In some instances, patients may resort to constraining the wayward, undesirable and sometimes embarrassing actions of the impaired hand by voluntarily grasping onto the forearm of the impaired hand using the intact hand. This observed behavior has been termed self-restriction or self-grasping.[34]

Mechanism of action of Neuromuscular-blocking agent

Quaternary muscle relaxants bind to the nicotinic acetylcholine receptor and inhibit or interfere with the binding and effect of ACh to the receptor. Each ACh-receptor has two receptive sites and activation of the receptor requires binding to both of them. Each receptor site is located at one of the two α-subunits of the receptor. Each receptive site has two subsites, an anionic site that binds to the cationic ammonium head and a site that binds to the blocking agent by donating a hydrogen bond. [35]

Non-depolarizing agents

A decrease in binding of acetylcholine leads to a decrease in its effect and neuron transmission to the muscle is less likely to occur. It is generally accepted that non-depolarizing agents block by acting as reversible competitive inhibitors. That is, they bind to the receptor as antagonists and that leaves fewer receptors available for acetylcholine to bind. [36,37]

Depolarizing agents

Depolarizing agents produce their block by binding to and activating the ACh receptor, at first causing muscle contraction, then paralysis. They bind to the receptor and cause depolarization by opening channels just like acetylcholine does. This causes repetitive excitation that lasts longer than a normal acetylcholine excitation and is most likely explained by the resistance of depolarizing agents to the enzyme acetyl cholinesterase. The constant depolarization and triggering of the receptors keeps the endplate resistant to activation by acetylcholine. Therefore, a normal neuron transmission to muscle

cannot cause contraction of the muscle because the endplate is depolarized and thereby the muscle paralyzed. [38,39]

Binding to the nicotinic receptor

Shorter molecules like acetylcholine need two molecules to activate the receptor, one at each receptive site. Decamethonium congeners, which prefer straight line conformations (their lowest energy state), usually span the two receptive sites with one molecule (binding inter-site). Longer congeners must bend when fitting receptive sites. The greater energy a molecule needs to bend and fit usually results in lower potency.[40]

Clonazepam

Clonazepam, sold under the brand name Klonopin among others, is a medication used to prevent and treat seizures, panic disorder, and for the movement disorder known as akathisia.It is a tranquilizer of the benzodiazepine class. It is taken by mouth. It begins having an effect within an hour and lasts between six and 12 hours.[41]

Moa of Clonazepam

Clonazepam acts by binding to the benzodiazepine site of the GABA receptors, which enhances the electric effect of GABA binding on neurons, resulting in an increased influx of chloride ions into the neurons. These further results in an inhibition of synaptic transmission across the central nervous system.[42]

Benzodiazepines do not have any effect on the levels of GABA in the brain. [43] Clonazepam has no effect on GABA levels and has no effect on gamma-amino butyric acid transaminase. Clonazepam does, however, affect glutamate decarboxylase activity. It differs from other anticonvulsant drugs it was compared to in a study.

Clonazepam's primary mechanism of action is the modulation of GABA function in the brain, by the benzodiazepine receptor, located on GABAA receptors, which, in turn, lead to enhanced GABAergic inhibition of neuronal firing. Benzodiazepines do not replace GABA, but instead enhance the effect of GABA at the GABAA receptor by increasing the opening frequency of chloride ion channels, which leads to an increase in GABA's inhibitory effects and resultant central nervous system depression.

In addition, clonazepam decreases the utilization of 5-HT (serotonin) by neurons [44,45] and has been shown to bind tightly to central-type benzodiazepine receptors. Because clonazepam is effective in low milligram doses (0.5 mg clonazepam = 10 mg diazepam), [46]

it is said to be among the class of "highly potent" benzodiazepines. [52] The anticonvulsant properties of benzodiazepines are due to the enhancement of synaptic GABA responses, and the inhibition of sustained, high-frequency repetitive firing.[47]

Nimbex

Uses of Nimbex:

It is used to calm muscles during surgery.

It is used to calm muscles while on a breathing machine.

Nuromax

Nuromax (doxacurium chloride) is a long-acting, nondepolarizing skeletal muscle relaxant for intravenous administration. Doxacurium chloride is [1α,2β(1'S*,2'R*)]-2,2'-[(1,4-dioxo-1,4-butanediyl)bis(oxy-3,1-propanediyl)]bis[1,2,3,4-tetrahydro-6,7,8-trimethoxy-2-methyl-1-[(3,4,5-trimethoxyphenyl)methyl]isoquinolinium] dichloride (meso form). The molecular formula is C56H78CI2N2O16 and the molecular weight is 1106.14. The compound does not partition into the 1-octanol phase of a distilled water/ 1-octanol system, i.e., the n-octanol: water partition coefficient is 0.

Zemuron

Uses of Zemuron:

It is used to calm muscles during surgery.

It is used to calm muscles while on a breathing machine.

Tracrium

Use of Traction

Production of skeletal muscle relaxation during surgery after general anesthesia has been induced.[58]

Facilitation of endotracheal intubation;[48] however, succinylcholine generally is preferred in emergency situations where rapid intubation is required. [49,50] A single dose should not be used in place of succinylcholine for rapid sequence induction of anesthesia (“crash intubation”). [57]

Treatment of Opioid-Induced Constipation: The Hard Facts

Treatment to increase pulmonary compliance during assisted or controlled respiration after general anesthesia has been induced. [51,52] Has been used for facilitation of mechanical ventilation in intensive care settings.

CONCLUSION

Alien hand syndrome, (AHS) is a rare neurological disorder that causes hand movement without the person being aware. Alien hand syndrome is defined as uncontrollable, but purposeful movements. As we earlier discussed there is no any reported treatment for that disease. We conculed that is neurological disorder and nerulogical disorder treated by neuromuscular blocking drug. That can treat the disease by control the involuntary action by neuromuscular blocking drug. Neuromuscular-blocking drugs block neuromuscular transmission at the neuromuscular junction, causing paralysis of the affected skeletal muscles. So the drug ClonazepamNimbexNuromaxZemuronTracrium.

While reviewing the disease " ALIEN HAND SYNDROME" I found that it is one of the rarest of the diseases due to it very low number of people have knowledge about it. Because of the strange symptoms of this disease the disease is been treated in different manner in different parts of world specially in rural areas of India.

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