



## **Kluver Bucy Syndrome: A Rare Neurological Disease with Several Challenges**

**Priyadarshi Prajjwal<sup>a\*</sup>, Ansh Chaudhary<sup>a</sup>, Raunak Ranjan<sup>a</sup>  
and Bhupendra Chaudhary<sup>b<sup>o</sup></sup>**

<sup>a</sup> Department of Medicine, Bharati Vidyapeeth Hospital and Research Centre, Pune, India.

<sup>b</sup> Department of Neurosciences, Jaswant Rai Speciality Hospital, Meerut, (U.P.), India.

### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/JAMMR/2022/v34i2231591

### **Open Peer Review History:**

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/91994>

**Review Article**

**Received 11 July 2022**  
**Accepted 21 September 2022**  
**Published 22 September 2022**

## **ABSTRACT**

Kluver Bucy Syndrome is an extremely rare disorder with a diverse presentation that can be confused with certain common diseases such as Korsakoff's psychosis, Pick's disease, and Alzheimer's dementia. The most common risk factors overall and in children include Herpes simplex encephalitis. In adults, temporal lobe stroke subsequent to several possible etiologies is the second most common cause. Almost any condition that affects the brain (majorly the temporal lobe) can lead to Kluver Bucy Syndrome, making it more difficult to find out the underlying cause. The syndrome is named after Paul Bucy and Heinrich Kluver who discovered it in the monkeys. The various manifestations occur because of the involvement of the amygdala and hippocampus in the temporal lobe and include amnesia which may be anterograde or retrograde, hyperphagia, hyperorality, hypersexuality, visual agnosia, and hypermetamorphosis. The limbic system may get affected causing the above manifestations too. Management of the Kluver Bucy Syndrome is challenging and needs more research as pharmacotherapy and behavioural therapies are the only known interventions to treat patients with KBS currently with not so good outcomes as the delay in the diagnosis makes it not respond to the medications quite a number of times. The diagnosis is mainly clinical and early detection and management of the underlying cause could help provide a good prognosis. In this Review article, we review the conditions leading to Kluver Bucy syndrome, its pathophysiology, clinical features, and the major challenges in its diagnosis.

<sup>o</sup>Professor, Senior Consultant Neurologist, Director and Head;

\*Corresponding author: E-mail: priyadarshiprajwal@gmail.com;

*Keywords: Kliver bucy syndrome; stroke; temporal lobes; amygdala; hippocampus; HSV encephalitis; hypersexuality.*

## 1. INTRODUCTION

The human brain is a truly confounding and perplexing entity. It has so many bewildering functions, which to comprehend has taken several decades for mankind, and yet there is an ocean left to be explored. With powers come responsibilities, and that's the reason the brain is the controller of the entire body. Innumerable responsibilities mean, a variety of things that could go wrong. Kliver Bucy syndrome is one such puzzling yet not so good manifestation that can result from dysfunction of one of the principal components of the human brain- the temporal lobes. Paul Bucy, a neurosurgeon, and Heinrich Kliver, a neuropsychologist, initially identified the Kliver Bucy syndrome [1]. This syndrome's narrative starts with a cactus. A cactus-derived substance called mescaline produces vivid hallucinations. Heinrich Kliver, a psychologist, researched it. He observed that mescaline treated monkeys frequently slapped their lips, which reminded him of people who were experiencing temporal lobe seizures. The couple used Aurora, an aggressive monkey, to study the brain area that mescaline affects. Due to the left temporal lobe's connection to seizures, they excised a significant portion of Aurora's left temporal lobe in order to examine it under a microscope. Aurora was no longer aggressive when she woke up. Such can be the astounding effects due to a lesion in the temporal lobe.

A rare neuropsychiatric condition called Kliver Bucy syndrome (KBS) is caused by lesions in both temporal lobes, particularly the hippocampus and amygdala. Visual agnosia, an increased propensity to examine objects with the mouth, hypermetamorphosis, dampening of emotional expression, altered sexual behaviour, and dietary variations were the six points of difference noted by Kliver in his experiment [2]. Patients rarely exhibit all of the symptoms of Kliver Bucy Syndrome, yet three or more are required for a diagnosis. The most prevalent signs in people are tameness, hyperorality, and dietary modifications. In order to support his discoveries, Kliver later came upon comparable observations made by Sanger Brown and Edward Albert Schafer that had been published in 1881 [3]. Marlowe discovered the syndrome for the first time in a meningoencephalitis patient in 1975. The syndrome has an equal prevalence in both males and females.

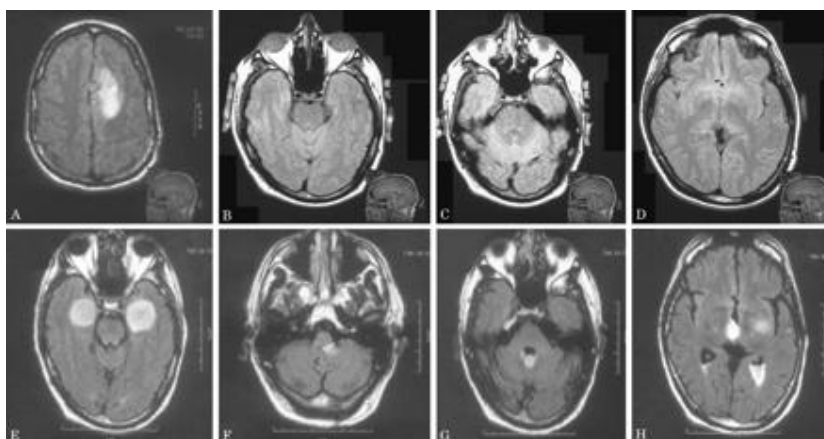
## 2. CONDITIONS PREDISPOSING TO KBS

- Herpes Simplex Encephalitis
- Temporal lobe stroke
- Glioma
- Meningoencephalitis due to Listeria
- Traumatic encephalopathy
- Cerebral Tuberculosis
- Alzheimer's dementia
- Hypoglycemia
- Frontotemporal dementia
- Porphyrias
- Cerebral Toxoplasmosis
- Tumors such as Hodgkins and Non-Hodgkins Lymphoma
- Cannabis exposure
- Parkinsons illness
- Taenia Solium Neurocysticercosis
- Shigella Infection
- Methotrexate toxicity
- Huntington's Chorea
- Korsakoff Psychosis

Herpes simplex encephalitis in children and brain injury in adults are the most frequent diseases causing the development of Kliver Bucy Syndrome [4]. A number of the above diseases affecting the temporal lobe and several others may overlap in their presentation to that of KBS [5]. So it's necessary to differentiate this rare complex from its differential diagnosis. The most common ones which can be confused are Frontotemporal Dementia, Alzheimer's, cannabis exposure, and Korsakoff Psychosis [6,7].

## 3. PATHOPHYSIOLOGY OF KLUVER BUCY SYNDROME

The bilateral loss of either the temporal neocortex or the amygdala results in substantial clinical signs. Because the anterior temporal lobe dysfunction in humans is typically less severe than what results after entire temporal lobe resection in monkeys, the full syndrome is uncommon in humans. There is still debate on the precise anatomical origin of KBS. Kliver Bucy Syndrome is believed to be caused by disruptions in the limbic networks' temporal regions, which connect to various cortical and subcortical circuits to influence emotional behaviour and affect [1]. The ventro median nucleus of the thalamus and the amygdala are involved in the production of rage.



**Fig. 1. Axial FLAIR images. Left cingulate gyrus imaging post biopsy (A). Imaging during the left cingulate gyrus lesion biopsy (B–D). Progressive lesions involving the bilateral amygdala (E) and imaging performed 5 months later showed tumor progression involving the medulla, 4th ventricle, and medial dorsal aspect of the thalamus (F–H)- Kluver Bucy Syndrome secondary to Glioma**

Distinct bilateral lesions of the lateral amygdala nucleus result in a hypersexual state. A transitory state could result from temporal lobe seizures. Bilateral ventral temporal ablations and temporal lobectomies cause visual agnosia.

**Etiological Theories:** According to Norman Geschwind's view, KBS is caused by the disruption of visual information to the limbic system, which results in disconnection syndrome [8]. Muller's hypothesis states that KBS is caused by a disruption of the neural connections between the prefrontal cortex and other limbic regions and the dorso medial thalamus. Memory and emotional control depend on these networks [9].

**Clinical Features:** Kluver Bucy Syndrome can have a range of clinical manifestations to almost none of them. The main clinical symptoms apparent in an adult suffering from KBS are Hyperphagia, Hypersexuality, Bulimia Nervosa, Placidity, Hypermetamorphosis, and Visual agnosia. Patients often present with less than three of the above symptoms and the complex is referred to as partial Kluver Bucy Syndrome. If more than three of the above symptoms are present, the complex is known as complete Kluver Bucy Syndrome.

Hyperorality is characterized by inappropriate licking in social situations and a strong want to put things in one's mouth. Lack of social inhibition in sexual behaviour, including inappropriate sexual behaviour and attempted copulation with inanimate things, extreme

attraction towards children pornographic materials, etc is known as hypersexuality. To combat visual agnosia, objects are put in the mouth and investigated with the tongue. Bulimia is a common eating disorder that is characterized by eating and then purging, which may result in weight gain. A lack of emotion and a weakened emotional reaction is termed placidity. The inability to recognize familiar faces or objects when they are presented visually is known as visual agnosia (psychic blindness).

The characteristic features of KBS manifest in children are hyperorality, Binge eating, pronounced indifference, absence of sentimental ties to friends and family, the habit of repeatedly touching their genitals, sporadic pelvic thrusts, and rubbing their genitals against their bed [10].

#### 4. DISCUSSION

The involvement of the bilateral lesions of the Hippocampi and the phylogenetically old medial temporal lobe regions is suggested by several anatomical imaging and clinical studies as being necessary for the development of this rare syndrome complex. In certain special circumstances, compression of both hippocampi occurs in addition to direct injuries to the temporal lobe (in cases of contusion or high velocity impact head injury) as the mechanism of harm. The clinical characteristics in the patients with tuberculous meningitis and Neurocysticercosis may be explained by the involvement of the temporal lobes by hydrocephalus in tubercular meningitis and the

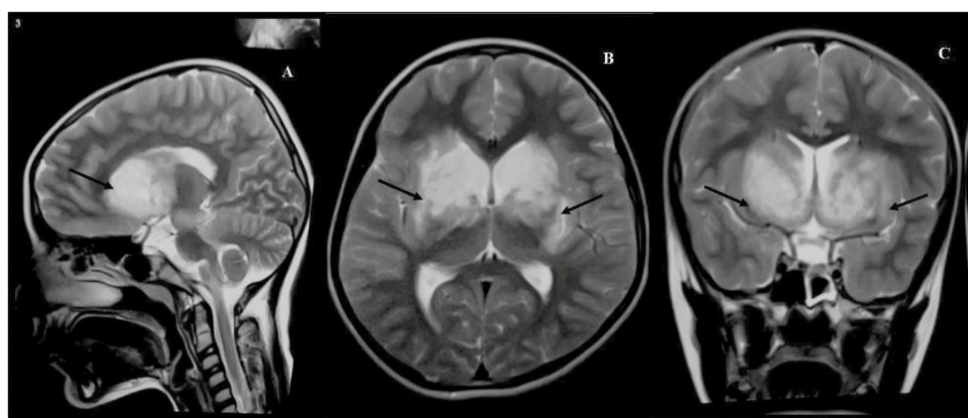
inflammatory response of the brain to the antigen released by the degenerating cysticercus cyst in Neurocysticercosis [11]. The patient with Kluver Bucy Syndrome and Neurocysticercosis demonstrated that this disease may be reversible in specific clinical situations. To avoid long-term effects, early detection of these illnesses and effective treatment is crucial.

Some KBS characteristics, such as self genital stimulation and hyperorality, are typical of children who have severe learning disabilities due to a number of known and unknown factors. The underlying mechanism, which is very complicated to be comprehended, is a result of a child's broad sensory and cognitive deficiencies, which frequently develop in a setting that is insensitive to their unique needs. It can be a challenging way to separate the non-specific from the particular etiological elements. Sexual behaviour can change in several ways and can get better after a temporal lobectomy if you have temporal lobe epilepsy that has caused the syndrome. According to one study, in as many as 71% of patients with temporal lobe epilepsy, ictal episodes were linked to changed sexual behaviour [12] 20% of patients displayed a range of paraphilias, while 80% of patients had experienced inter-ictal hyposexuality. Unilateral temporal lobectomy in hyposexual patients typically resulted in an increase in desire that might eventually had become pathological. On the other hand, abnormal sexual behaviour associated with temporal lobe epilepsy seizures also received much attention. Perhaps seizures

are a reflection of transitory bilateral malfunction of the temporal lobe.

In their summary of their experiences with posttraumatic KBS cases, Gerstenbrand included clinical information on 40 case subjects who were diagnosed between 1978 and 1981. The incidence of KBS symptoms was reported despite the absence of specific case information [13]. In 30 cases, there were signs of bulimia, memory issues, hyperorality, and visual agnosia. Hypersexuality and aggression were seen in 18 and 11 instances, respectively. At one year, 12 cases of hypersexuality persisted, 8 cases of bulimia, and 10 cases of aggression.

Goscinski postulated that edema or swelling of the brain and compression of the arteries can cause bilateral damage to the mediobasal temporal lobe [14]. According to Yoneoka's theory, the right temporal and basal frontal lobes' temporary malfunction brought on by edema may be reflected in the symptoms of KBS [15]. Deginal and Changty posited abnormalities of networks bridging the dorsomedial thalami with prefrontal cortices and other limbic regions, whereas Slaughter proposed combinations of posterior frontal and anterior temporal lobe deficits. It is noteworthy that the degree of personality disorders did not correlate with the severity of neurological deficits [16]. More recently, Caro and Jimenez postulated that KBS, independent of its genesis, is caused by mesio temporal lesions or other changes (potentially temporary) that result in hypofunctioning in the amygdala or its projections [17].



**Fig. 2(A–C). MRI of the brain: T2W images (indicated by black arrows in 2A: Sagittal section; 2B: Transverse section; 2C: Coronal section) showing signal hyperintensities in bilateral basal ganglia, thalamus, insular cortex, and brain stem- KBS in an adolescent girl secondary to HSV encephalitis [18]**

**Treatment:** There is in fact no specific treatment for Klüver Bucy Syndrome. Also, each patient's clinical signs and symptoms vary and are unique which makes treating this condition even more difficult. However, the common drugs and therapy in use to treat this rare entity are-

- Mood stabilizers
- Antidepressants especially Selective Serotonin Reuptake Inhibitors
- Carbamazepine
- Leuprolide
- Haloperidol (and other antipsychotics)
- Cognitive Behavioral Therapy
- Psychoeducation

Haloperidol and anticholinergic drugs are helpful in treating behavioural abnormalities linked to KBS, whilst carbamazepine and leuprolide are used to lessen sexual behavioural anomalies. Lithium and Valproate sodium are used as the preferred mood stabilizers. Patients with KBS secondary to traumatic brain injury have been observed to fare better when using carbamazepine. Carbamazepine is the preferred first line agent used widely in clinical settings for the management of Klüver Bucy Syndrome. Mood Stabilizers and antipsychotics are used as add on drugs depending on the symptoms and signs.

## 5. CONCLUSION

Klüver Bucy Syndrome is a rare and interesting syndrome complex, which occurs most commonly after an episode of Herpes Simplex infection in children and Temporal lobe stroke in the case of adults. Diagnosis is supported by MRI imaging and Bilateral amygdala and hippocampus manifestations are the most prevalent manifestations. The majority of patients respond to carbamazepine but still, there is no definite cure. The condition should be explained to the patient's family members, who should also be advised that treatment may not always be effective. They should be informed that circumstances could arise that call for the restriction of a patient physically. Some Klüver Bucy Syndrome characteristics, such as hyperorality, placidity, and hypermetamorphosis, may last forever while others gradually decrease and may completely resolve. The prognosis of KBS caused by epileptic seizures, infections, and traumatic brain traumas may be better because many of the impairments are repairable with prompt diagnosis and treatment.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Lanska DJ. The Klüver-Bucy Syndrome. *Front Neurol Neurosci.* 2018;41:77-89. DOI: 10.1159/000475721. Epub 2017 Nov 16. PMID: 29145186.
2. Klüver-Bucy Syndrome Following Traumatic Brain Injury: A Systematic Synthesis and Review of Pharmacological Treatment From Cases in Adolescents and Adults, Fiona J. Clay, Anu Kuriakose, Dorothea Lesche, Amelia J. Hicks, Hadar Zaman, Elham Azizi, Jennie L. Ponsford, Mahesh Jayaram, and Malcolm Hopwood, *The Journal of Neuropsychiatry and Clinical Neurosciences.* 2019 31:1, 6-16.
3. Brown Sanger and Sharpey-Schafer Edward Albert, An investigation into the functions of the occipital and temporal lobes of the monkey's brain *Phil. Trans. R. Soc. Lond.* 1888;XI(B179):303-327. Available:<http://doi.org/10.1098/rstb.1888.0011>.
4. Eikmeier G, Forquignon I, Honig H. Klüver-Bucy-Syndrom nach Herpes-simplex-Enzephalitis [Klüver-Bucy syndrome after herpes simplex encephalitis]. *Psychiatr Prax.* 2013;40(7):392-3. German. DOI: 10.1055/s-0033-1343274. Epub 2013 Jul 11. PMID: 23846508.
5. Chou CL, Lin YJ, Sheu YL, Lin CJ, Hseuh IH. Persistent Klüver-Bucy syndrome after bilateral temporal lobe infarction. *Acta Neurol Taiwan;* 2008.
6. Kile SJ, Ellis WG, Olichney JM, Farias S, DeCarli C. Alzheimer abnormalities of the amygdala with Klüver-Bucy syndrome symptoms: an amygdaloid variant of Alzheimer disease. *Arch Neurol;* 2009.
7. Raju VV, Sankhyan N, Padhy SK. A Single Exposure to Cannabis Presenting with Klüver-Bucy Syndrome in a Child: A Rare

- Case Report. Indian J Pediatr. 2022;89(2): 208.  
DOI: 10.1007/s12098-021-03997-x. Epub 2021 Nov 6. PMID: 34741255.
8. Geschwind N. Disconnexion syndromes in animals and man: Part I. 1965. Neuropsychol Rev; 2010.
  9. Müller A, Baumgartner RW, Röhrenbach C, Regard M. Persistent Klüver-Bucy syndrome after bilateral thalamic infarction. Neuropsychiatry Neuropsychol Behav Neurol; 1999.
  10. M Das J, Siddiqui W. Kluver Bucy Syndrome. [Updated 2022 Jul 20]. In: Stat Pearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022.
  11. Jha S, Patel R. Kluver- Bucy syndrome - An experience with six cases. Neurol India [serial online]; 2004.
  12. Klüver-Bucy Syndrome Following Traumatic Brain Injury: A Systematic Synthesis and Review of Pharmacological Treatment From Cases in Adolescents and Adults; Fiona J. Clay; 2018.
  13. Gerstenbrand F, Poewe W, Aichner F, et al.: Klüver-Bucy syndrome in man: experiences with posttraumatic cases. Neurosci Biobehav Rev; 1983.
  14. Góscinski I, Kwiatkowski S, Polak J, et al.: The Kluver-Bucy syndrome. J Neurosurg Sci; 1997.
  15. Yoneoka Y, Takeda N, Inoue A, et al. Human Kluver-Bucy syndrome following acute subdural hematoma. Acta Neurochir (Wien); 2004.
  16. Slaughter J, Bobo W, Childers MK: Selective serotonin reuptake inhibitor treatment of post-traumatic Klüver-Bucy syndrome. Brain Inj; 1999.
  17. Caro MA, Jimenez XF: Mesiotemporal disconnection and hypoactivity in Kluver-Bucy syndrome: Case series and literature review. J Clin Psychiatry; 2016.
  18. Kar SK, Das A, Pandey S, Gupta B. Kluver–Bucy syndrome in an adolescent girl: A sequel of encephalitis. J Pediatr Neurosci; 2018.

© 2022 Prajwal et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*

*The peer review history for this paper can be accessed here:  
<https://www.sdiarticle5.com/review-history/91994>*