

Klüver-Bucy Syndrome in Man: Experiences with Posttraumatic Cases

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GERSTENBRAND, F., W. POEWE, F. AICHNER AND L. SALTUARI. *Klüver-Bucy syndrome in man: Experiences with posttraumatic cases*. NEUROSCI BIOBEHAV REV 7(3) 413-417, 1983.—After the original description of characteristic behavioral changes in rhesus monkeys after bilateral resection of major portions of the temporal lobes by Klüver and Bucy in 1937 [11], similar syndromes have repeatedly been reported in human pathology. The present paper is based on clinical analysis of 40 cases of traumatic apallic syndrome (TAS), 30 of whom developed a complete or partial Klüver-Bucy syndrome during recovery. The dynamics in the development of a Klüver-Bucy syndrome during remission of a TAS are analyzed. The delineation between a pre-stage, full-stage and remission-stage of the Klüver-Bucy syndrome is suggested.

Brain injury Traumatic apallic syndrome Klüver-Bucy-syndrome Primitive motor patterns

IN 1937 Klüver and Bucy [11] were first able to demonstrate gross behavioral changes in *Macaca rhesus* following bilateral removal of major portions of the temporal lobes including most of the rhinencephalic structures (uncus and hippocampal gyrus, nucleus amygdalae). The behavioral syndrome of the animals now eponymously bearing the authors' names was characterized by the cardinal symptoms summarized in Table 1 [12, 13, 14]. While appearing unable to recognize the objects of their surroundings the animals attended to every visual stimulus with a seemingly "irresistible" impulse to touch every object in sight and to examine all objects by mouth. Aggressiveness was markedly decreased and hypersexuality was present in forms of heterosexual, homosexual and autosexual behavior.

Following the animal experiments by Klüver and Bucy several authors drew attention to similar behavioral changes in human pathology. Grünthal [8] described a case of hypoglycemic cerebral damage who had developed severe dementia, levelling of affect and marked oral tendencies with grasping for all objects in sight and taking them into the mouth. Post-mortem examination of her brain revealed bilateral hippocampal necrosis. The probably most striking equivalent of a Klüver-Bucy syndrome in human pathology was reported by Terzian and Dalle Ore [22] in a young male patient with intractable temporal lobe epilepsy in whom an almost complete bilateral temporal lobectomy had been performed. Their case exhibited marked "hypermetamorphosis" reaching for all objects in sight, but not taking them into his mouth. Instead he developed bulimia; hypersexuality was present together with placidity, loss of affect and memory. In the following years further reports on Klüver-Bucy-like syndromes in humans were generally based on the notion that oral tendencies comprise the cardinal manifestation in human Klüver-Bucy syndrome [19]. Besides oral tendencies most cases described also showed placidity, hypersexuality and frequently hypermetamorphosis and memory disturbances.

The etiology of human cases is quite diverse and includes degenerative diseases of the brain [2, 17, 18], cerebrovascular disease [17], encephalitis, especially of herpes simplex etiology [1, 4, 10, 16, 21, 23], traumatic brain injury [3, 5, 6, 7], surgical brain lesions, mainly for treatment of temporal lobe epilepsy [15, 19, 22] and also rare cases of metabolic disturbances of the brain [9,20]. In the majority of human cases for which a "complete" or "partial" Klüver-Bucy syndrome has been described the behavioral changes represent a stable defect syndrome due to given brain lesions. In this article we wish to describe certain dynamic aspect in the development and also remission of Klüver-Bucy symptomatology observed in our material of severely brain injured patients.

CASE MATERIAL

From 1978 through 1981 clinical data of 40 patients who after severe brain injury had developed a traumatic apallic syndrome as described by Gerstenbrand [5,6] and summarized in Table 2 were analyzed. Patients included 31 males and 9 females aged 7 to 33 years (mean 17.2). The clinical observation and treatment period ranged from 3 to 7 (mean 5.5) months after cerebral trauma had occurred.

Out of the 40 cases 30 patients did recover from the full stage of the traumatic apallic syndrome (TAS) in the stepwise remission course described previously [5,6]. Six patients died between 5 and 10 weeks after their accidents in the full stage of TAS. Four patients did only reach an early remission stage of the TAS and did not show further remission.

From the development of grasping patterns accompanied by the tendency to take grasped objects into the mouth, bulimia, hypermetamorphosis, hypersexuality, affective disturbances and memory disturbances a Klüver-Bucy syndrome could be delineated in 18 cases (see Table 3). In a further 12 patients grasping of objects with oral tenden-

TABLE
THE KLÜVER-BUCY-SYNDROME IN MONKEYS

1. "Psychic blindness" or visual agnosia
2. Intensive oral tendencies
3. Extreme distractibility or reactivity on visual stimuli ("Hypermetamorphosis")
4. Decrease of aggressiveness and loss of fear ("Placidity")
5. Hypersexuality
6. Changes in dietary habits

Summary of symptomatology of the Klüver-Bucy syndrome in monkeys.

TABLE 2
SYMPTOMATOLOGY OF THE TRAUMATIC APALLIC SYNDROME (TAS)

1. Coma vigilé (wakefulness without apparent conscious activity, sleep-wake cycles independent of day-night rhythm)
2. Lack of reaction to external stimuli (painful stimuli lead to delayed mass movement combined with tachycardia, tachypnea)
3. Loss of emotional reactions
4. Flexed position of extremities; increased muscle tone (rigidospasticity); hyperreflexia; positive pyramidal tract signs and motoric automatisms
5. Primitive motor patterns (sucking, chewing, grasping, etc.)
6. Disinhibition of autonomous functions

Summary of the clinical signs of the traumatic apallic syndrome (TAS) as described by Gerstenbrand [5,6].

cies, bulimia together with disturbances of short term memory occurred during one period of clinical observation without signs of hypersexuality and characteristic affective changes. These patients were classified as having a partial Klüver-Bucy syndrome. All patients were unable to recognize the objects they grasped; however, the term "visual agnosia" seems inappropriate because of the presence of a diffuse disturbance of higher cortical functions. In all cases the time course of appearance and remission of Klüver-Bucy symptoms during recovery from the apallic syndrome was analyzed.

RESULTS

The Klüver-Bucy syndrome as it was observed in our patients recovering from a traumatic apallic syndrome is summarized in Table 4. The parallels to the animal syndrome of Klüver and Bucy are evident.

In analyzing the evolution of Klüver-Bucy symptomatology during the remission of an apallic syndrome a stepwise development is usually apparent. While motor phenomena in the full stage of the apallic syndrome are largely restricted to mass movements of trunk and extremities and to primitive motor patterns and motoric automatisms (see Table 2) the evolution of Klüver-Bucy symptoms in these patients is accompanied by the development of object-oriented and instinctive actions. In detail the following stages of evolution of Klüver-Bucy symptoms in apallic patients can be delineated.

The remission process of TAS is initiated by clearance of Coma vigilé, beginning synchronisation of sleep-wake cycles

TABLE 3
OCCURRENCE OF KLÜVER-BUCY SYMPTOMS IN PATIENTS RECOVERING FROM TRAUMATIC APALLIC SYNDROME (TAS) (N=40)

Inability to recognize objects ("Visual agnosia")	30 cases
Grasping of objects to take them into the mouth	30 cases
Hypermetamorphosis	12 cases
Bulimia	30 cases
Hypersexuality	18 cases
Affective disturbances	
Placidity	24 cases
Aggressiveness	11 cases
Memory disturbances	30 cases

Frequency of occurrence of various Klüver-Bucy symptoms during the remission course from the traumatic apallic syndrome (TAS) in 40 patients.

TABLE 4
KLÜVER-BUCY SYNDROME DURING RECOVERY FROM TAS (FULL STAGE)

Compulsive grasping of objects taking them into the mouth
 Irresistible impulse to attend to and grasp every object in sight (hypermetamorphosis)
 Inability to recognize objects
 Bulimia
 Hypersexuality (autosexual acts)
 Loss of fear and shame
 Euphoric mood
 Severe memory disturbance (no learning processes)

Clinical characterization of the full-stage of Klüver-Bucy syndrome during recovery from TAS.

with day-night cycles, optic fixation and primitive fright reactions on painful stimuli and in its second phase it is characterized by optic following and diminishing of primitive fright reactions and disinhibition of vegetative functions.

In what we wish to call the "pre-stage" of Klüver-Bucy syndrome patients are awake but do not show signs of higher cortical activity in that they do not perceive or react to their environment and appear as being "panagnostic." Spontaneous motor activity is dominated by holokinetic mass movements; on the other hand "stereotyped" motor patterns that occur are predominantly of the oral type with chewing and sucking automatisms. Concomitantly one can observe the appearance of unidirectional grasping movements. There may be so-called "pre-sexual" manipulations with the genitals. True emotional reactions are still absent in this stage but remnants of fright reactions may be present (Table 5).

These largely pre-formed primitive movement patterns change into object-directed instinctive movements when the full-stage of the Klüver-Bucy syndrome is reached. In this phase patients react to their environment but there is still lack of higher cortical functions with apractic, agnostic and aphasic disturbances being present. The patient's attention is



FIG. 1. Klüver-Bucy syndrome during recovery from TAS. patient grasping a piece of soap (a) and chewing it (b).

TABLE 5

PRE-STAGE OF KLÜVER-BUCY-SYNDROME

lack of higher cortical functions ("Panagnosia")
 undirected grasping movements and directed oral primitive patterns
 play-like ("pre-sexual") manipulation with genitals
 lack of directed emotional reactivity

Clinical characterization of the pre-stage of a Klüver-Bucy syndrome during recovery from TAS.

easily distracted (similar to "hypermetamorphosis"). All reachable objects in the patient's visual field are grasped and compulsively raised to the mouth to be bitten or chewed or sucked at with apparent inability to recognize those objects. A piece of soap may be eaten like an apple without disgust (Fig. 1) or a knife may be bitten without recognition of the possible injury. Bulimia may become evident in this phase. There is hypersexuality confined to the own body (autosexual acts) without feelings of shame. Motivation and affect are blunted, with a somewhat euphoric mood (Placidity) (Table 4). Memory functions are lost, patients do not show any learning process in this phase.

When during the recovery from a traumatic apallic syndrome higher cortical functions show first reintegration, the compulsive grasping and oral patterns become more complex and start to integrate into "normal" motor patterns. Patients may, for example, grasp the examiner's reflex hammer and raise it to the lips imitating the act of smoking a cigarette (Fig. 2). When presented, the examiner's hand is regularly raised to the mouth imitating a hand kiss (Fig. 3). At the same time the patients are not aware of the "meaning" of the movement they perform seemingly compulsively.



FIG. 2. Klüver-Bucy syndrome during recovery from TAS. Patient performing "smoking" movement with reflex hammer.



FIG. 3. Klüver-Bucy syndrome during recovery from TAS. "Hand kiss"-pattern.

TABLE 6
REMISSION STAGE OF KLÜVER-BUCY SYNDROME

Beginning reintegration of higher cortical functions
Compulsive grasping and oral patterns integrate into "normal" motoric actions
Occasional bulimia
Hypersexuality directed towards environment, decrease of autosexual acts
Lack of shame
Increased emotional reactivity, suggestibility
Memory disturbance

Clinical characterization of the remission stage of Klüver-Bucy syndrome during recovery from TAS.

In this phase bulimia is observed often. Hypersexual trends become directed to the environment either homo- or heterosexually both in form of verbal expression and in form of attempts to sexual activities with persons of the environment without signs of shame. Autosexual trends diminish (e.g., masturbation). Emotionally patients may exhibit a friendly euphoric mood with increased suggestibility or, less frequently, be dysphoric and irritable with occasional sham-rage-like outbursts especially when inhibited in their instinctive actions. Memory is regularly severely impaired. When compared to the "full-stage" of Klüver-Bucy syndrome this phase is characterized by increased interactions with the environment on the levels of motor patterns, hypersexuality and emotional reactions. We thus suggest to call this phase "remission-stage" of Klüver-Bucy syndrome in post apallic patients since further behavioral normalization usually follows this stage (see Table 6).

During a one year follow-up of the 30 patients who had

TABLE 7
PERSISTENCE OF KLÜVER-BUCY SYMPTOMS AT 1 YEAR FOLLOW UP (N=30)

Oral tendencies, bulimia	8 cases
Hypersexuality	12 cases
Affective disturbances	26 cases
Placidity	16 cases
Aggressiveness	10 cases

Frequency of various Klüver-Bucy symptoms at 1 year follow up of 30 patients recovered from TAS.

developed Klüver-Bucy symptomatology during recovery from the traumatic apallic syndrome we did not observe a persisting "complete" Klüver-Bucy syndrome. In the psychoorganic defect stage seen at a control examination 1 year after the accident affective disturbances either as placidity or irritability and changes in sexual behavior were the most frequent "remnants" of the Klüver-Bucy phase (see Table 7).

The further remission of a traumatic apallic syndrome after the Klüver-Bucy stages is characterized by the development Korsakoff-symptomatology followed by different psychoorganic phases.

DISCUSSION

Our clinical data show that Klüver-Bucy symptoms occur frequently during the remission course of a traumatic apallic syndrome (TAS) as has been reported before [3, 5, 6, 7]. Com-

pulsive grasping combined with oral patterns and signs of hypersexuality are the cardinal symptoms in the posttraumatic cases. However, when the time course of evolution of the different groups of Klüver-Bucy symptoms is taken into account then the Klüver-Bucy syndrome occurring during recovery from a traumatic apallic syndrome appears as a dynamic functional state generally exhibiting a trend towards "reintegration" of higher cortical functions. The line of development is one from autism and self-restricted automatism towards increasing interaction with the environment. Thus indirectional grasping becomes object-oriented, together with the oral patterns it develops into

pseudo-meaningful stereotypes: autosexuality is replaced by heterosexual tendencies and levelling of affects develops into emotional overreactivity. On this evolutionary line we suggest in posttraumatic cases to delineate a pre-stage, full-stage and remission-stage of the Klüver-Bucy syndrome.

Although clinicopathologic correlations are either missing or inconclusive due to disseminated cerebral damage we hypothesize that the development of a Klüver-Bucy syndrome out of an apallic syndrome means reintegration of cortical function on the level of a "disinhibited" limbic system and remission of the Klüver-Bucy syndrome likewise corresponds to further reintegration of cortical functions.

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