

Bruxism and Psychotropic Medications

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Abstract

Mental Health Disorders including schizophrenia, bipolar and schizoaffective disorders are often treated using psychotropic medications with evidence that some of these medications such as antipsychotics could be associated with significant oral side-effects. In this comprehensive review, we examine the psychotropic medications mechanisms of action and their oral side-effects, with specific focus on psychotropic medications and bruxism as a major oral health complication with a negative impact on the quality of life of mental health sufferers, relevant to psychiatrists, dentists and general practitioners. Bruxism could be caused by the antipsychotics extrapyramidal side-effects through dopaminergic receptors. Bruxism as a side-effect of psychotropic medications could result in significant consequences to oral health such as tooth structure destruction and irreversible harm to the temporomandibular joint. The review findings could assist in understanding the aetiology of bruxism, establish appropriate management plan, while supporting psychiatrists and dentists to detect temporomandibular dysfunctions (TMD) such as bruxism.

Introduction

Mental health conditions such as depression and psychosis are prevalent ranging from 15-25% of the population ¹. Hence, a significant proportion of dental patients could suffer from co-morbid mental health diseases and the dentists may be their first point of contact in community and hospital settings. Patients suffering from mental health conditions have a higher risk of poor oral hygiene ², which is increased with the chronic use of antipsychotics, antidepressants and mood stabilizers ³.

Several oral conditions such as bruxism could be due to the mental health condition or a result of the psychotropic medications adverse-effects with evidence that schizophrenia patients are more vulnerable to the development of Temporomandibular dysfunction (TMD) signs such as bruxism ⁴, while there is a clear relation between Selective Serotonin Reuptake Inhibitors (SSRI) use and the risk of bruxism ^{5,6} and nocturnal bruxism has been reported with venlafaxine ⁷.

TMD is described as pain and dysfunction of the masticatory musculature and/or the temporomandibular joint (TMJ) (joints connecting the mandible to the skull) and associated structures with no clear single aetiology with suggested multifactorial aetiologies including anatomical, neuromuscular, psychological, trauma and general diseases ⁸. Patients suffering with TMJ problems may present with pain, limited range of jaw motion, clicking noises, dislocation with occlusal changes; deviation of the jaw to the side, forward protrusion of the mandible, difficulty swallowing, mouth drooling, difficulty chewing and articulating ⁹. These clinical symptoms may also be associated with tooth wear and functional habits. TMJ dislocation is usually unilateral, although reports showed that the mechanical energy derived from oromandibular dystonia could cause bilateral dislocations.

Bruxism is a common problem with worldwide prevalence 5% to 40% ¹⁰. This prevalence is high in children and adolescents with mental health conditions (~30.0%) ¹¹ or developmental disabilities (25% to 69%) ¹²⁻¹⁴. Bruxism is a motor disorder ¹⁵ involving a repetitive jaw-muscle activity, an involuntary act of clenching or grinding one's teeth, either while awake or asleep, in an occasional to constant manner ¹⁶. Sleep bruxism, which is more common, is characterized by a rhythmic activity of the temporomandibular muscles causing a forced contact between dental surfaces; accompanied by tooth clenching or grinding with anxiety and stress as established risk factors ¹⁷. Bruxism has been implicated in tooth wear ¹⁸, where tooth attrition (a gradual loss of hard tooth substance from occlusal contacts with an opposing dentition or restoration) may be accelerated by parafunctional habits of bruxism ¹⁹. Bruxism could lead to jaw-muscle hypertrophy; fracture or failure of teeth restorations or implants ²⁰. The International Classification of Sleep Disorders suggests the following criteria for sleep bruxism: (I) the presence of teeth grinding during sleep; and (II) at least one associated feature: abnormal tooth wear, muscular discomfort, or sound associated with the tooth grinding ²¹.

Methods

In this review, we searched the published literature on the association between antipsychotics and bruxism (National Library of Medicine's PubMed and PsycINFO databases) for published articles between January 1980 and February 2017 using keywords "oral diseases," "bruxism" in association with one of the following: "antipsychotics", "stimulants"; "dopaminergic" "Psychotropic medications ", to identify the research papers describing the link between antipsychotics and bruxism.

Furthermore, a search using the term bruxism was carried out on the weekly journal Reactions, which deals with the side effects of drugs and the VigiAccess database through Uppsala monitoring centre for drug side effects to detect relevant information regarding the association between bruxism and dopamine-related medications.

Pharmacology of Psychotropic Medications and Bruxism Aetiology

Neuropharmacological studies in animals described the striatum as the brain structure involved in gnawing/biting behaviour²² and suggested oral motor activities could be influenced by dopamine (DA) antagonists²³, while D2 receptors functional neuroimaging in sleep bruxing individuals showed a possible central dopaminergic system role in the pathophysiology of sleep bruxism²⁴. Urinary levels of catecholamines, specifically adrenaline, noradrenaline and dopamine, in subjects with bruxism were higher compared to control individuals²⁵. The mechanism of bruxism is not fully understood. It could be due to peripheral morphological alterations such as malocclusion^{26, 27} or multifactorial aetiology including psychological, physiological factors²⁷ with the possibility as a centrally mediated condition, modulated by drugs acting on CNS neurotransmitters.

DA is a catecholamine neurotransmitter and a precursor for norepinephrine and epinephrine. Catecholamines affect complex processes such as mood and attentiveness and their pathways arise from small clusters of neurons with widely divergent projections²⁸. DA receptors are G-protein coupled receptors, where activation of D1 class (D1 and D5) leads to increased cAMP, while D2 class (D2, D3, and D4) activation inhibits cAMP generation. These receptors are expressed in the brain, where they play a role in motor control, prolactin secretion and motivation and affect regulation²⁸. DA is the therapeutic target in several CNS disorders, including

Parkinson's disease (PD) and schizophrenia; schizophrenia is in part caused by dysregulated DA neurotransmission in the brain as shown by PET scans ²⁸, while amphetamines and cocaine increase DA levels and/or activate DA receptors leading to a schizophrenia-like state ²⁸.

Antipsychotics long-term use, especially first generation, may cause extrapyramidal side-effects (dystonia/dyskinesia) due to DA receptor blockade in the basal ganglia leading to slowness, stiffness, tremor, tardive dyskinesia ²⁹; involuntary hyperkinetic motor disorders affecting the orofacial region such as bruxism ³⁰. Oral dyskinesia could cause TMJ degenerative changes, mucosal lesions, damage to teeth and dental prostheses, while oromandibular dystonia produces involuntary and excessive contractions of tongue, lip and jaw muscles ³¹. Second generation antipsychotics (SGA) such as clozapine, olanzapine and quetiapine could ameliorate the negative symptoms of schizophrenia and have a relatively low affinity for D2 receptors with effects on oral health, although to a lower extent. Other dental complications associated with psychotropic medications include xerostomia ³² and rabbit syndrome ³³. Risperidone was more associated with tardive dyskinesia compared to clozapine, olanzapine and quetiapine ³⁴. SGA have a high incidence of metabolic dysfunction, weight gain; when associated with poor oral hygiene, may cause other oral diseases such as dental caries ³⁵.

Stimulants such as amphetamine, 3,4-methylenedioxymethamphetamine (ecstasy), and cocaine exert their effects by enhancing norepinephrine and/or dopamine ³⁶.

Amphetamines oral health complications ³⁷ include broken or missing teeth, bruxism, xerostomia ³⁸ and increased risk of gingival enlargement ³⁹. Ecstasy is also associated with bruxism, periodontitis and xerostomia ^{40, 41}.

Bruxism and Antipsychotics Medications

Several clinical studies showed higher TMD signs among psychiatric patients especially those suffering from schizophrenia ^{2, 3, 42}. Factors associated with bruxism studied in 389 children with developmental disabilities showed that individuals with reported involuntary movements had a greater chance of exhibiting bruxism with an increased risk with psychotropic drugs use ⁴³. In 339 institutionalized patients compared to matched-control subjects, the prevalence of TMD signs, severe tooth wear and bruxism were significantly higher ⁴². Abnormal attrition was evident in 46.8% of the psychiatric patients compared with just 20% in the control group with significant differences in mean muscle sensitivity to palpation, joint sensitivity to palpation and range of mouth opening ³. Abnormal attrition involves both enamel and dentin with extensive hard tissue loss that cannot be easily restored. A case report described the successful management of antipsychotic induced bruxism upon switching to clozapine; while another report presented two cases of acute bruxism and akathisia, as early side-effects of antipsychotics, which were relieved by adding propranolol ²³. Eight cases of bruxism following long-term treatment with haloperidol were described ⁴⁴.

Pain Perception in Schizophrenia

As there are few controlled studies, there is a debate regarding sensation threshold, pain threshold, and pain tolerance ^{45, 46}. Patients suffering from psychotic disorders may not be reliable in reporting the pain due to their psychiatric disorder as schizophrenia could cause impairment in communication and social skills, while psychotropics may affect pain perception. Several psychiatric reports confirmed the insensitivity to pain with possible affective and sensory abnormalities ⁴⁷⁻⁵⁰. For schizophrenia patients, behavioural pain activity and self-reported responses to pain

are reduced⁵¹. This could lead to delays in diagnosis and treatment, for example long-term bruxism may cause the transition of pain from an acute to a chronic phase, causing disability and psychologic distress⁵².

Bruxism in patients on Psychostimulants

Psychostimulants may seriously damage the oral environment and cause bruxism by deregulating the DA mesocortical pathway. Methylphenidate, commonly used in the treatment of attention-deficit hyperactivity disorder (ADHD), could induce sleep bruxism⁵³ as highlighted in a case report of 2 ADHD children who developed dyskinesia and bruxism⁵⁴. Long-term drug abuse led to a high prevalence of oral motor behaviour, and signs/symptoms of TMD⁵⁵. Amphetamine users displayed typical, continuous chewing or tooth-grinding movements and bruxism^{37, 56, 57} and a large cohort study confirmed methamphetamine association with bruxism³⁷. A case study reported three patients suffering from awake bruxism after chronic MDMA consumption⁵⁸ and a study on the subjective experience/psychologic and behaviour sequel of the intake of MDMA, 30% of the patients reported bruxism as an adverse effect⁵⁹. Among cocaine users, severe bruxism symptoms were reported⁶⁰ and several reports confirmed the detrimental effects of cocaine misuse on oral health^{61, 62}. Repeated stimulation of the dopaminergic systems with apomorphine and cocaine increased non-functional masticatory movements and mandibular incisors attrition rate in rats⁶³.

Discussion

Oral health is of primary importance for patients suffering with mental disorders as it can influence social interactions and exacerbate psychosocial aspects. TMD involves the masticatory musculature and/or the temporomandibular joint and associated structures and are often associated with pain and/or parafunctional

activities, such as bruxism with the long term use of psychotropic medications acting as a possible culprit³. A meta-analysis showed that anti-depressants such as duloxetine, paroxetine and venlafaxine were associated with sleep bruxism, however, no clear association between valproate, carbamazepine or benzodiazepines with bruxism found (low overall quality of evidence)⁶⁴.

Schizophrenia is a severe and debilitating condition that influences an individual's quality of life especially by lack of perception of general and oral health. Patients suffering from schizophrenia could present with only a small number of remaining teeth, non-functional teeth with excessive mobility; advanced stages of periodontitis. They are more prone to the TMD signs and severe tooth wear⁴² due to the psychotropic medications antagonist activity on the DA receptors⁶⁵. Furthermore, some typical antipsychotics have strong anticholinergic activities similar to tricyclic anti-depressants, with further detrimental effects on oral hygiene such as reduced saliva secretion resulting in dry mouth with occasional swallowing difficulties, increased risk of caries, gingivitis, periodontitis and candidiasis⁶⁶.

A search carried on the weekly journal Reactions, which deals with medications side effects and VigiAccess database (Table 1 and Figure 2) confirmed bruxism as an oral side-effect associated with psychostimulants and antipsychotics including chlorpromazine, trifluoperazine, haloperidol and aripiprazole. There were 58 hits for Bruxism as an oral side effect in Reactions, however, there are limitations regarding the available information on number of individuals exposed to each drug and the likely risk of polypharmacy.

The available evidence suggests a relation between tooth wear, psychiatric disorders and administration of certain drugs. Poor oral hygiene and extensive unmet needs for dental treatment can be significant among psychiatric patients with increased

incidence of TMJ disorders due to the psychiatric illness or the psychotropic medications side-effects, as well as lifestyle differences. The risk of bruxism is higher in special populations such as children and older people. More research is needed to draw definite conclusions concerning how substances affecting the dopaminergic, serotonergic and adrenergic systems could ameliorate or exacerbate bruxism in humans. The awareness of patients, psychiatrists, dentists, general practitioners and nurses that many psychotropic drugs cause side-effects related to oral health could improve remarkably the early detection and patient management. Extra precautions are needed, especially for patients with more than one co-morbid mental health issues with the possibilities of poly-pharmacy including combinations of antipsychotic and antidepressants. Furthermore, precautions must also be taken when performing surgery or prescribing analgesics, antibiotics or sedative agents due to adverse interaction with psychiatric medications. BMS treatment is not necessary in some cases; however, if severe, options include dental approaches such as oral appliances to reduce tooth damage and relieve jaw pain, psychological therapies such as cognitive behavioral therapy and pharmacological treatment including switching the psychotropic medications to an alternative with lower risk of Bruxism.

Declaration of Interest: None

Key points

- Several clinical studies showed higher incidence of bruxism among psychiatric patients especially those suffering from schizophrenia.
- Bruxism could result from peripheral morphological alterations such as malocclusion or multifactorial aetiology including a centrally mediated condition, modulated by drugs acting on CNS neurotransmitters.

- Psychostimulants may seriously damage the oral environment and cause bruxism by deregulating the DA mesocortical pathway.
- BMS management include dental approaches such as oral appliances, psychological therapies and switching the psychotropic medications to an alternative with lower risk of Bruxism.

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Table 1: Antipsychotic Drugs and their associated dental problems (Adapted from eMC and Reports/VigiAccess)

Dental Oral Condition	Antipsychotic medications associated with dental oral condition
Bruxism	Haloperidol, Aripiprazole, Perphenazine, Prochlorperazine, Olanzapine, Paliperidone, Risperidone, Quetiapine
Dry mouth	Haloperidol (common), Aripiprazole, Perphenazine, Prochlorperazine, Olanzapine (common), Paliperidone, Risperidone (common), Quetiapine (very common), Chlorpromazine (very common), Fluphenazine, Pericyazine, Trifluoperazine, Zuclopenthixol, Amisulpride (common) , Clozapine (common), Lurasidone (common), Promazine and Levopromazine (very Common)
Hypersalivation	Aripiprazole, Sulpiride, Zuclopenthixol, Amisulpride (very Common), Clozapine (very common), Lurasidone (common)
orofacial dyskinesia	Perphenazine

*Very common ($\geq 1/10$), common ($\geq 1/100$ to $< 1/10$), uncommon ($\geq 1/1,000$ to $< 1/100$), rare ($\geq 1/10,000$ to $< 1/1,000$)

Figure 1: the number of reports showing antipsychotics medications associated with mastication disorders (Uppsala monitoring VigiAccess, search conducted 8.2.17)

