



# Oral healthcare management in heroin and methadone users

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## Abstract

Heroin addiction is associated with poor oral health. Oral and dental care in heroin addiction might be complicated by altered mental status, negative attitude towards oral health, dental anxiety and fear, drug interaction, and associated medical co-morbidity. We present the oral findings and discuss the dental, behavioural, and anaesthetic management considerations in a 46-year-old man who had dental anxiety and had been an intravenous heroin user for the past 23 years.

## Introduction

The global burden of diseases related to drug abuse is estimated to be 5.6% worldwide, and is believed to be responsible, both directly and indirectly, for the death of nearly half a million individuals in 2015.<sup>1</sup> Recent estimates indicate that 21.5 million American adults suffer from substance abuse, and nearly one in 12 adults in England and Wales use illicit drugs.<sup>2,3</sup> Opioids, including heroin, are among the most commonly used recreational drugs, with an estimated 34 million users worldwide.<sup>1</sup>

Heroin is an opioid most frequently used for its euphoric effects. It is also known as dimorphine, and in the street it is called 'big H', 'smack', 'junk', 'horse', 'dope', and 'brown' among other names.<sup>4</sup> It can be snuffed, smoked or injected, and acts through activation of the brain's opiate receptors to stimulate the pleasure feelings by releasing a high level of dopamine.<sup>5</sup> Heroin causes a high degree of physical and psychological dependence, and chronic use of heroin results in a wide variety of debilitating effects on individual, economic, and social levels.<sup>5</sup> Heroin addiction is associated with adverse effects on various body systems including the cardiovascular, respiratory, central nervous, gastrointestinal and genitourinary systems.<sup>6</sup> In addition, nearly 40% and 17% of intravenous (IV) heroin abusers have been exposed to some form of hepatitis and human immunodeficiency virus respectively.<sup>7</sup> Heroin abusers usually suffer from personal neglect, psychosis, malnutrition, and uncontrolled overdose, which can result in respiratory arrest and death.<sup>8</sup>

Heroin withdrawal is combined with several unpleasant effects such as nausea, vomiting, abdominal pain, tremor, body shaking, myalgia, and tachycardia. Treatment of heroin addiction is often challenging and requires a multidisciplinary approach that involves behavioural, social, and pharmacological interventions.<sup>8</sup> Methadone, which acts as a full  $\mu$  receptor agonist, is widely used as a treatment for heroin addiction.<sup>9</sup> Maintenance therapy

with oral methadone appears to be an effective and accepted intervention for heroin dependence not only because it reduces heroin use, injecting practices and crimes, but also because it improves social functioning, physical symptoms and quality of life among users.<sup>10</sup> Methadone, however, can potentially be subjected to abuse, and there is a potential for methadone overdose as it acts as a full agonist. Furthermore, drug interactions are often a cause of mortality and morbidity, and patients on methadone commonly have medical and psychological co-morbidity or may abuse other illicit substances leading to adverse reactions.<sup>11</sup>

The effect of heroin addiction and its treatment on oral health is not well studied, but previous studies have demonstrated a higher prevalence of caries and periodontal diseases among heroin users due to poor diet, hyposalivation, personal neglect, inadequate oral hygiene practice, and altered microbiome.<sup>12,13,14,15,16</sup> Furthermore, the provision of proper oral health care for heroin users might be complicated by the negative attitude towards dental care, the altered mental status, anxiety and fear, drug interaction and associated medical co-morbidities.

In this report, we present the oral findings and discuss the dental, behavioural, and anaesthetic management considerations in a 46-year-old man who had been an IV heroin user for the past 23 years. In addition, we discuss limitations and difficulties in the provision of oral and dental health care for drug abusers.

## Case report

A 46-year-old unemployed man presented to restore dental aesthetics and function. His medical history was significant for epilepsy, chronic anxiety, malnutrition and heroin addiction. His medications included carbamazepine (200 mg/day), diazepam (25 mg/day), thiamin (100 mg/day), vitamin supplements, and methadone (105 mg/day). He had extreme dental anxiety and negative attitude towards dental care and oral hygiene; he scored 21 out of 25 on the Modified Dental Anxiety Scale (MDAS). He smoked electronic cigarettes and didn't drink alcohol.

Extraoral examination revealed cutaneous pallor, multiple tattoos, finger clubbing, and weight loss (BMI = 16.1). Intraoral examination revealed mucosal pallor, moderate mouth dryness according to the Challacombe scale,<sup>17</sup> chronic plaque-induced gingivitis, extensive cervical caries involving most teeth, and badly broken unrestorable lower right

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Fig. 1 Pre-treatment clinical photographs show poor oral hygiene, multiple cervical caries, badly destructed teeth, and chronic gingivitis



Fig. 2 Radiographic examination: a) orthopantomogram (OPG) showing generalised horizontal alveolar bone loss, multiple carious and unrestorable teeth; b) full mouth intraoperative periapical radiographs (IOPA) showing caries, furcational involvement and chronic periapical infection

first and second molars, upper second molar, and upper first premolar (Fig. 1). Radiographic examination, including orthopantomogram (OPG) and full mouth periapical radiographs, revealed extensive cervical caries, impacted lower third molars on both sides, generalised horizontal alveolar bone loss consistent with chronic periodontitis, and furcational involvement of upper and lower molars (Fig. 2).

The upper left and right lateral incisors were judged to be non-vital and unrestorable.

A treatment plan was discussed with the patient and the complexity of treatment and the need for multiple dental visits were explained. The disease control phase of our treatment plan involved dietary advice, oral hygiene instructions, a smoking cessation programme, prescription of Colgate Duraphat toothpaste

5,000 PPM, extraction of unrestorable teeth, scaling and root surface debridement, and restoration of decayed teeth. The patient was also advised to drink plenty of water and use sugar-free chewing gum to improve oral hydration. The rehabilitation phase involved replacement of missing teeth with a modified acrylic partial denture, and the patient was planned for a six-monthly dental maintenance programme (Fig. 3).

Given the complexity of planned treatment and the extreme dental anxiety of our patient, a decision to provide dental care under conscious sedation was made. Pre-operative evaluation involved assessment of the patient's cardiac and respiratory status, and his overall fitness to sedation was evaluated according to the American Society of Anaesthesiologists (ASA) scale. The patient's complete blood count (CBC), prothrombin time (PT) and partial thromboplastin time (PTT) were within normal. In the first dental treatment session, intravenous sedation with midazolam was titrated up to 5 mg and the patient was adequately sedated. However, a paradoxical reaction characterised by irritability was evident ten minutes after the onset of sedation necessitating treatment cessation. In the second treatment session, a decision to use inhalation sedation (nitrous oxide and oxygen) was made because of the paradoxical effect and the difficult cannulation, due to poor vein access, encountered in the first dental treatment session. The patient was adequately sedated and accepted treatment with local anaesthesia. A total of nine dental treatment sessions with inhalation sedation were needed to extract unrestorable teeth, provide periodontal treatment, and restore decayed teeth. It is worth mentioning that, although dental care was provided under sedation, behavioural management techniques, explanation, empathy, and reassurance were adopted throughout treatment to improve the patient's compliance, minimise dental anxiety, and ensure the patient's adherence with the follow-up schedule.

During follow-up visits, the patient showed better cooperation with the dental team and accepted scaling, root surface debridement, and fluoride varnish application without the need of any adjunctive sedation. Given the risk of fracture and aspiration of the small acrylic denture fabricated during the early phase of treatment, we decided to add some of the gutta percha cones to the acrylic teeth and to the base of denture with some metal wire (Fig. 4). A cobalt-chromium denture will be constructed in the future to provide a safe and more resistant oral prosthesis in case of an epileptic fit. Patient consent was obtained before all procedures and photographs.

## Discussion

Poor oral health in heroin users can be attributed to several reasons (Box 1). Personal neglect associated with the emotional and physical dependence to heroin leads to negative attitudes towards dental care, poor oral hygiene habits, and low overall awareness about oral health.<sup>18</sup> In addition, heroin addiction and methadone treatment are associated with reduced salivary flow; this, in combination with the poor diet and high sugar intake frequently observed in heroin addicts, creates a favourable environment for the formation of plaque and development of caries and periodontal diseases.<sup>19,20</sup> Furthermore, it has been demonstrated that heroin addiction and methadone treatment cause impairment in immune function due to reduced levels of immunoglobulin G (IgG), IgM, and IgA, which may predispose to dental caries and periodontitis.<sup>21</sup>

In addition to caries and periodontal disease, heroin addicts may suffer from various other oral diseases (Box 2). Our patient demonstrated the typical oral adverse effects of heroin and methadone use, including caries particularly prevalent on smooth and cervical surfaces, chronic periodontitis, and hyposalivation. Many heroin and other drug users may not be willing to disclose their drug addiction; oral healthcare professionals, therefore, should be aware of the more common features suggestive of drug abuse such as personal neglect, poor general hygiene, malnutrition, constricted pupils, ambiguous behaviours and different types of cutaneous tattoos.<sup>22</sup>

Heroin addicts often present with advanced dental disease because of personal neglect, dental anxiety, and masking of dental pain due to the analgesic and mental detachment effects of heroin. The dental management of heroin and methadone users is often challenging, not only because of the high prevalence and late presentation of dental diseases, but also because of various medical, social, lifestyle, and psychological issues that influence oral health care in this group of patients.

Heroin users often suffer from psychological problems that are frequently associated with general anxiety and heightened dental fear.<sup>18</sup> Interestingly, patients using methadone were reported to exhibit a phobia of needles, especially in the hands of others, which may further accentuate dental anxiety and explain the negative attitude towards dental treatment.<sup>23</sup> Management of dental anxiety can be extremely challenging in heroin users because of altered mood, mental detachment, reduced responsiveness to local anaesthesia, and the tendency of drug addicts to present a fictitious history of pain and pretend



Fig. 3 Post-treatment clinical photographs (before dental extraction of the veneered upper lateral incisors with gold crowns and rehabilitation phase with a modified partial denture)

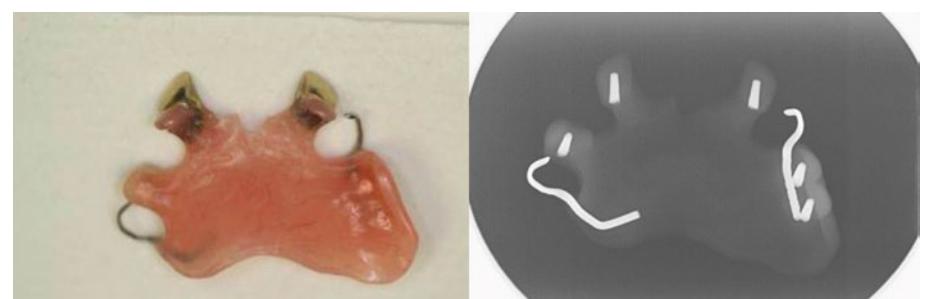


Fig. 4 A modified upper partial denture with some gutta percha cones added to the acrylic teeth and to the base of denture to facilitate identification of denture's parts in case of aspiration during an epileptic fit. Upper lateral incisors were veneered with gold crowns of the extracted teeth per patient's request

inadequate analgesia to obtain a specific class of sedatives and analgesics. In such circumstances, special care dentists need to be mindful and pay extra effort to explore the fear of their patients, provide reassurance, establish trust and rapport, and apply behavioural management techniques. Although this might prove unsuccessful, it will definitely provide some benefits of improving the patient's attitude and acceptance of dental treatment in the long run, as was evident in this report (Table 1).

Pain and anxiety control using sedation techniques might, therefore, be necessary to allow proper dental treatment in some circumstances. This, however, might be complicated by the use of heroin and methadone. Intravenous sedation in IV drug abusers might be difficult because of difficulty in finding a proper vein for IV access. Furthermore, adequate sedation might not be achievable at normal therapeutic doses due to tolerance and disinhibition induced by opioid abuse,<sup>2</sup> however, it is not absolutely contraindicated. Potentially serious drug

interactions, including hypotension and respiratory depression and arrest, might happen between IV sedative drugs and opiate agonists and other central nervous system depressant drugs commonly used by drug addicts.<sup>24</sup> Therefore, if intravenous sedation is required, it should be delivered in a secondary care centre with experts in conscious sedation techniques.

Importantly, our patient developed a paradoxical reaction with midazolam sedation; this is a relatively common event during sedation of patients who are addicted to drugs. In such an event, patients become more anxious and treatment may be difficult. Administration of more midazolam will increase the patient's irritability and the use of a reversal agent (that is, flumazenil) might be unpredictable. Once the patient develops a paradoxical effect, dental treatment should be discontinued, and alternative anxiety management strategies should be tried.<sup>25</sup> The use of general anaesthesia for dental procedures in heroin/methadone users may not be desirable on the basis that it is potentially capable of inducing relapse

**Table 1 Pre-operative sedation assessment and treatment planning for anxious patients who are addicted to drugs<sup>25</sup>**

Assessment items	Explanation
Recognise signs of anxiety	Common signs of anxiety include sweaty hands, clenched fists, pallor, distractred appearance, aggressive behaviour, while symptoms; dry mouth, need to visit lavatory, fainting, tiredness and sweating. The severity of anxiety can be determined using the Modified Dental Anxiety Scale (MDAS)
Explore patient's fears and build trust	A satisfactory first visit in the nature of an informal 'chat' that aims to build the trust with the patient. This visit also helps to determine patient's concerns, needs and specific causes of fear or anxiety
Obtain detailed medical history and evaluate fitness	In addition to the overall assessment (weight, gait, cyanosis, jaundice, and pallor), specific attention should be paid for respiratory, cardiovascular, liver, kidney, and infectious diseases. Baseline recording for heart rate and arterial blood pressure and assessing patient's physical fitness according to the American Society of Anaesthesiologist (ASA) to help determine the suitability of patients to be treated in general dental practice (ASA I and II) or in a specialist centre (ASA III and IV). At this stage, it is also important to assess oropharyngeal airway, and potential difficulties in I.V access. Haematological tests, including CBC, PT, PTT, and INR, should be used when clinically indicated
Determine dental treatment needs	Thorough dental examination of severely anxious patients might not be possible, and a conclusive dental treatment plan might be difficult to formulate. A brief visual inspection and adequate history about previous dental treatment might help to determine patient's dental treatment needs and asses the complexity of dental care
Assess patient's social circumstances and the availability of a responsible adult escort	Alternative anxiety management options, other than IV sedation, should be sought if a responsible adult escort is not available

**Table 2 Main barriers and challenges to oral health in heroin and methadone users**

Barrier/difficulty	Management
Negative attitude to oral health	Improve oral health awareness by providing a tailored and focused oral health care educational materials
Limited access to oral health care services	Consider oral health care an integral part of the overall management of heroin addicts
Dental anxiety/phobia/fear	Treat patients with empathy, reassurance, and explanation Explore patient's fears and apply behavioural management techniques Use sedative techniques when indicated
Poor diet	Educate patient about healthy diet; liaison with dietician might be necessary Encourage healthy lifestyle Discourage carbohydrate rich diet Contact patient's physician regarding the use of sweetened methadone syrup Frequent use of fluoride and prescription of fluoride containing toothpaste
Dry mouth and altered oral microbiome	Improve oral hydration Utilise saliva substitutes and sialogogues as clinically indicated Maintain good oral hygiene and regular dental prophylaxis Apply fluoride regularly and use fluoride containing toothpaste
Altered drug metabolism	Careful drug history to avoid any potential drug interaction In case of sedative drugs, use drugs with low toxicity profile and minimal drug interaction Avoid hepatotoxic drugs if liver function is impaired
Impaired haemostasis	Careful medical history and clinical examination to explore any bleeding tendency Bleeding profile assessment (CBC, PT, PTT, INR) if history or clinical examination suggest a bleeding tendency
Cross-infection risk	Careful history and direct questioning about blood-borne infections Apply standard cross-infection procedures without stigmatisation of the patient
Cardiac valves damage	Consult patient's physician regarding the presence of valvular damage and the need of antibiotic prophylaxis Follow local guidelines and regulations regarding the use of antibiotic prophylaxis when indicated

in a recovering drug abuser.<sup>26</sup> Furthermore, toxicology screening might be necessary before general anaesthesia to examine drug levels, particularly if there is any doubt regarding the patient's pre-operative sobriety. The use of inhalation sedation (nitrous oxide and oxygen) might, therefore, be a safer and more practical alternative for management of dental anxiety in heroin users. Inhalation sedation has limited drug interactions with opiate agonists and CNS depressants and doesn't routinely require placement of an IV cannula. Our patient showed good response to inhalation sedation and dental treatment was adequately and safely performed.

Heroin abuse might cause thrombocytopenia and serious post-operative bleeding might occur, particularly if liver function was impaired due to previous or concomitant alcohol use or infection with hepatitis viruses.<sup>27</sup> Bleeding profile assessment, including platelet count, prothrombin time (PT), partial thromboplastin time (PTT), and international normalized ratio (INR), might be necessary before dentoalveolar surgery; particularly when the history suggests a bleeding tendency or when clinical signs of bleeding tendency are evident. Our pre-operative assessment showed that our patient had normal platelet count and his clotting function was adequate, as demonstrated by the normal INR level.

Intravenous drug abuse remains the most common method of transmission of blood-borne infections in industrialised countries. Nearly 40% and 17% of IV heroin abusers have been exposed to some form of hepatitis and human immunodeficiency virus respectively.<sup>7</sup> Heroin abusers may attend the dental clinic asymptomatic, unaware, or unwilling to disclose their disease. Therefore, direct questioning about blood-borne infection and liaison with the patient's medical practitioner are required to reveal the presence of infectious disease. Standard cross-infection precautions should be followed when treating heroin addicts, such as the disposal of infected materials and disinfection of laboratory work, but without making patients feel stigmatised because of their potential cross-infection risk.

Intravenous drug abusers might be at increased risk of infective endocarditis due to physical damage of heart valves produced by bulking agents in the injected material.<sup>28,29</sup> Consultation with the patient's physician is necessary to determine the presence of valvular damage, and if antibiotic prophylaxis is recommended, dentists are encouraged to follow their local guidelines and recommendations of antibiotic prophylaxis for prevention of infective endocarditis.<sup>30</sup>

## Conclusion

Heroin abuse and methadone therapy can negatively affect oral and dental health. Oral and dental management of heroin users is often challenging because of associated medical, social, and psychological comorbidities (Table 2). Behavioural management, reassurance, explanation, and empathy are key elements for the successful management of dental anxiety in heroin users. Special care dentists have an important role in the overall management of heroin addicts by encouraging a healthy lifestyle and improving the patient's attitude towards health care services.

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## Box 1 Risk factors for oral diseases in heroin and methadone users

- Personal neglect
- Low general and oral health awareness
- Dental anxiety and fear
- Impaired access to oral health care services (including lack of insurance, phobia, lifestyle, poor memory)
- Hyposalivation
- Altered taste response and craving for sweets behaviour
- Poor diet and malnutrition
- The use of sweetened methadone syrup
- Impaired immune response
- Altered oral microbiome

## Box 2 Oral diseases associated with heroin addiction

- Dental caries (cervical and smooth surface caries)
- Chronic periodontitis
- Acute necrotising ulcerative gingivitis/periodontitis
- Oral candidiasis and other oral infections including angular cheilitis
- Sialadenitis
- Sialosis
- Tooth surface loss (attrition)
- Altered taste
- Burning mouth
- Mucosal atrophy
- Oral epithelial dysplasia and possibly oral cancer

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