



Case report

Posture in difficult dental home care settings, case series

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Abstract: Dentistry is well known as being specifically physically demanding, considering the access, visibility, and difficulty of the operating field. Providing dental services to patients with severe limitations at home is a common request. Dental home care operators have many more duties than regular surgery duties. A dental home operatory setting can be completely different from surgery because operators must determine where to stand and how to position the mobile dental unit (MDU), the instruments, and their assistance all in relation to the patient's head. Position can play a significant role in performing smooth, successful, stress-free dental procedures. The operator's role is to select the most ergonomically sound position for themselves and their assistants depending on their knowledge, the available setting, and the type of dental procedure. The concern of posture is frequently discussed in literature because of its major contribution to the etiology of musculoskeletal disorders (MSDs), but never enough to encourage dentists to adopt healthy, safe working position within home care settings. This case series describes three bedridden patients who received dental services at home for various medical reasons. All were considered difficult positions as the patients were totally immobile. This case series aims to analyze postural strategies and provide practical ergonomic recommendations for dental professionals in complex domiciliary settings.

Keywords: posture; ergonomics; dentistry; dental home care; geriatric

1. Introduction

Establishing dental home care for patients, particularly children, is emphasized by organizations, such as the American Academy of Pediatric Dentistry [AAPD] [1]. It is considered a mean for promoting early interventions in the form of primary detailed therapeutics, preventive interventions,

continuity of care, and improved/optimal oral health outcomes throughout a child's lifespan. Like the medical home model, the dental home care concept aims to enhance the patient experience, improve health outcomes, and reduce oral health disparities [2].

Dental care settings intend to maintain oral hygiene and the health of teeth. Comprehensive, continuous, and timely care are all parts of the dental home care concept that is applied with lots of cultural sensitivity [3]. Dental homes strive to provide timely care access, convenient appointment scheduling, extended hours, and after-hours emergency services to accommodate patients' needs [1]. Dental home care became more acceptable after COVID 19 pandemics [4].

In the modern world, there is an increasing number of adult patients in need of dental home care services. These patients may be able to move to a certain limit or may be totally bedridden and moving them to the dental chair can be impossible. These cases are termed difficult cases as these patients cannot be transferred to a dental chair and need treatments in certain unconventional settings. Their management is challenging, due to the position of the operator, the mobile dental unit (MDU), and the assistant while keeping the operating working zones and clock position to maintain safety and comfort for all [5].

In ergonomics, posture is defined as the placement of a person's body segments while performing different activities, meanwhile, in the dental office, there is nothing like an ideal operating posture [6]. Dentists have been working in both standing and sitting positions depending on their preference and the type of procedures they perform.

Dentistry, if practiced with the dentist standing and the patients being seated in an upright position, will cause the dentist to stand in a distorted and awkward body posture, resulting in an abnormal strain in ligaments and joints, especially in the zygapophyseal joint, sacroiliac joint, and cervical vertebrae and their attached muscles [7,8]. Hence, a healthy posture is defined as the relative position of the components of the body in a situation where the body's supporting structures are protected from further injury or development of deformities [6]. The role of the operator is to try to adjust the patient's position, the assistant, the equipment, and themselves to the best possible healthy posture [7].

Prolonged or recurrent improper posture may cause musculoskeletal disorders (MSDs) and disturb the active working life of dentists, as they suffer neck strain and the famous low back pain that is widely reported in the dental community [9,10].

But what is the practical posture? Many dental professionals adopt a certain posture, choosing to stand or sit based on the specific needs of each procedure and their comfort. For example, a sitting position may be preferable when lengthy or delicate procedures require precision; however, if shorter treatments where mobility and visibility are prioritized, standing may be the go-to position [11]. While sitting is usually in the front position or the performance logic back position [12]. The clock position differs in the case of left-handed (LH) or right-handed (RH) operators. Consider a RH operator, the patient's head is at noon and the operator at 8:00–12:00, with instrumentation from the 7:00/8:00–12:00 position [13] in the front position. In the back position or the performance logic (PL) model, the operator performs procedures from the back position using clock position ranging range 10:00–12:30 for RH operators [14].

The clock position should be maintained while operating at a dental home, either sitting or standing. The sitting position, especially on an ergonomically designed dental stool, can promote better posture by supporting the lower back and allowing the feet to rest flat on the floor [15]. It generally causes less strain on the legs, back, and feet, reducing the risk of musculoskeletal disorders associated with prolonged standing. The sitting position can provide a more stable base for the hands and arms,

potentially improving precision during detailed procedures. However, it may limit access to certain areas of the mouth, requiring the dentist to lean or adjust more frequently. When seated, moving around the patient or changing the position may be slower or more cumbersome [16]. Combining both approaches in dental home care sitting positions can help compromise the patient's position and the operator's layout, which can sometimes be challenging [17].

Any position should only be maintained for some time, and having a correct posture may not be meaningful, as the human body is created to move and adopt various position [9,10]. The literature also affirms that the working position should be changed as frequently as possible to transfer the loads of muscles from one group to another and supply the muscles that are maintaining the posture by new blood [18,19]. Working in an acceptable posture was associated with lower muscle activity and, therefore, a reduced level of pain [6].

The debate between standing and seating position while practicing dentistry involves ergonomics, health, efficiency, and personal preference considerations. Each position has advantages and disadvantages, and the choice often depends on the specific procedure, the patient, and the dentist's physical condition [20]. Dental home care gadgets contain a portable dental chair and stool, which makes the process easier and more accessible; however, in difficult cases, moving the patient is sometimes impossible and standing could be the most common approach with a difficult layout of the dental operator [5].

Positioning the patient on the dental chair in a supine position in accordance with the guidelines may be impossible; hence, standing provides better visibility and access [21]. It allows for greater mobility around the patient, making it easier to adjust positioning quickly. Standing may be preferable for short dental home care procedures or those that require the dentist to exert more physical force [9,10].

However, prolonged standing can lead to lower back pain, leg fatigue, and foot discomfort, especially without proper flooring or footwear [22]. Proper equipment, such as overhead light with magnification, can support a healthy posture and reduce neck and back strain [23]. Regular breaks, exercises, and stretches are also important to prevent musculoskeletal problems while operating at a dental home in any position [24].

Of definite importance is not to rush to perform procedures after diagnosis but take the essential time to examine the patient in relation to the room and the possible position for all the staff and the equipment. Take more time to test the selected posture and try to the best of your ability to select the more ergonomic and safe positions. Extra time may be needed to position everything as planned and then test safety and accessibility and modify as per seating position. It may be necessary to use extra gadgets or split the procedure into parts with rest periods in between. Only then should the operator begin the procedure. In some cases, it may be necessary to delay until certain conditions are possible to perform in the safest and most accessible position.

This paper intends to discuss the postures that dentists adopt in difficult dental home seating positions by taking three relevant case studies into consideration and providing the best recommendations.

2. Cases description

At all dental home, the operator and the assistant use full personal protective equipment (PPE) and prepare the seating position for the procedure with respect to infection control and safety. The procedure starts with removal of all unnecessary items within the seating position followed by disinfection spray for all surfaces that will be used or touched, after that the use of barriers for all

surfaces like tables and handles. Ergonomics and occupational safety guidelines (OSHA) is implemented in dental home as adjustable workstations and allowing breaks to prevent strain [1]. Using magnification loops with overhead light is a significant add to dental home care gadgets to reduce flexion and neck strain.

2.1. Case 1

The patient was an 85-year-old female with severe pain in lower left posterior segment persistent for few weeks, not responding to medication. The patient is morbidly obese, diabetic, and bedridden. During the home visit, the patient was examined clinically, past medical and dental history were assessed, and random blood sugar and blood pressure were measured.

The lower left last molar was mobile, causing severe spontaneous pain and pain under percussion. The patient's blood sugar, vital signs, and blood pressure were assessed and deemed fit for extraction under local anesthesia.

The patient's position was considered difficult because the patient was completely unable to move. The only feasible position is to gain access to the lower left posterior side and manage the extraction at a lower height using an unstandardized chair.

Operators had to kneel beside the patient and use foam knee support cushions. Operator could access the patient's right side from 9:00 to 11:00, maintaining clock position for RH operators. Patient head support was maintained using foam support cushions. The assistant was seated on the right side from 12:00 to 3:00 and the transfer zone from 5:00 to 9:00.

The process was divided into two parts, and a 15-minute break was taken between the anesthesia and the extraction process. Using an overhead light source with magnification reduced the amount of bending, flexion, and extension of the back muscles, neck, and arms.

Extraction was done without complications, post-operative instructions and medication were given, and patient recovery was uneventful.

2.2. Case 2

The home care department received a request from an 82-year-old female patient. The patient complained of fractured removable partial denture (RPD) abutment, improper fitting denture and difficulty in eating. Patient records indicated chronic cardiac disease, heart failure, and receiving anticoagulant therapy. The patient is morbidly obese, is unable to move out of bed, and can only be moved by ambulance to the hospital. Several visits were designed to take impressions, register her bite, and try in and deliver a new RPD, as well as post-delivery fitting and adjustments visits.

At the patient's home, it was noticed that she was using a hospital bed. this is an advantage that allowed the operators to move around while standing. The patient bed could be moved on wheels and allow adjustment of the height and back position to suit an ergonomic operator position while performing the procedure.

Low speed straight hand piece supported by an MDU was used to adjust special trays and make denture fitting final adjustments during try in and after delivery. MDU has high volume suction to control aerosols. Operators use full PPE for protection as a standard protocol in all dental home care procedures.

The visits were multiple and consecutive but were short; each visit was 10–15 minutes for impression, try in, and delivery. The mobile bed allows mobilizing the patient maintaining proper clock

positions, operation, and clearance zones. The procedures were executed uneventfully and removable partial denture was delivered successfully.

2.3. Case 3

The patient was a 65-year-old bedridden female suffering severe rheumatoid arthritis who has been immobile for years and received several homecare services for her chronic illness. The patient complained of severe pain as her upper second left premolar was fractured, causing trauma and bleeding. The patient was morbidly obese and could not be moved to the portable chair. Medical and dental history were taken; history revealed previous endodontic treatment several years ago and no crown, which led to fractured palatal cusp while eating.

The case was challenging as accessing her bed was only through a small narrow corridor on her right side 9:00–12:00, the operator was unable to get ideal access or clearance zones around the patient's head. In the meantime, the assistant had limited access to the patient's left side. She had to set up instruments on the bedside, and the MDU had to be placed at a distance from the patient within the static zone, creating a wide transfer zone. A second assistant was necessary to help transfer instruments safely and avoid crossing over the patients' body.

The procedure involved anesthesia, extraction of the fractured part, composite restoration for the remaining part, and finishing.

It was helpful to divide the procedure into two consecutive visits to reduce strain on the operators and shorten the visits. The first visit was to remove the broken palatal part followed by temporization. The next visit was for composite restoration, finishing, and reduction of the palatal cusp to prevent further trauma. The operator utilized magnification and an overhead light source. The MDU had an option of operating the machine continuously without foot control. This provided the operator with better support and less strain on leg muscles. The patient's head was supported by cushions to avoid postoperative pain.

The procedures went uneventfully with the patient fully relieved; however, her seating position provides an alarm to families to usually consider hospital beds for bedridden patients. Her family was advised to change her seating position to make treatments faster and easier.

3. Discussion

Low back pain and neck strain are common issues among dental professionals. Low back pain was the most reported symptom by dentists in the USA, followed by pain in the neck, shoulder, upper back, and legs. Understanding the causes, prevention strategies, and management techniques is crucial for dental practitioners, especially those providing at home services in order to maintain their health and career longevity. It is considered important to do risk assessment and periodic ergonomic adjustments. While at the dental home, reevaluate and adjust the dental operatory setup, including the height and position of the patient chair and consider the use of ergonomic tools, especially in difficult seating positions [9].

The choice between standing and sitting positions in difficult dental home care situations is fully acceptable and is judged case by case considering patient mobility status, personal preference, ergonomic principles, and the nature of the dental procedure. In Case 1, the operator was seated, which was suitable for a bedridden patient, where the vertical position cannot be changed. However, foam

cushions were needed for support of both patient and operator. In Case 2, a standing position for short durations was a suitable choice for a bed that can be adjusted vertically. Case 3 was the most difficult and a standing position was the most suitable, as access to the patient was very limited, the bed could not be adjusted vertically. Hence, the procedure was divided into two sessions. Proper support for the legs was obtained by utilizing the auto-power mode of the MDU, where the operator does not need to use the foot control.

In the seated position, the disc pressure in the area of the second to fourth lumbar discs was higher than in standing and recumbent ones. Ligament tension adds further pressure, specifically compressive forces, to the intervertebral discs [25]. The spine, the pelvic girdle, and the legs and feet are the primary structures used to support the body weight. The lumbar and sacral vertebrae orientations are crucial as these vertebrae, together with the discs and muscles adjoining them, will bear most of the spinal load when seating position [26]. However, when standing, the spine regains its curved position, so the body's balance may pass through the trunk to the feet. Thus, muscles need only a little exertion to hold the body upright and keep the trunk erect.

It is worth noting that the positioning of the assistant, instruments, and the location of the MDU can be of significant benefit to the operator's best ergonomics. Adhering to the clock position guidelines and the work, transfer, static, and assistant zones is a great starting point [27]. Avoid wide transfer zone as in Case 3. In Cases 1 and 2, the adherence to the zones was possible as creating 360 degrees clearance around the patient was possible. However, in Case 3, a wide transfer zone was a result of difficult access and lack of full clearance around the patient. Adding one more assistant could help manage the wide transfer zone and facilitate the process.

Occupational risk assessment for operators while standing at the dental home should include quantification of the amount of flexion and extension, joint loads for the neck, arms, and lower back due to small angles of flexion and extension, which have a huge effect on the force values acting on the intervertebral ligaments [28]. Flexion angles higher than 75% of the physiological flexion produce high tensile forces in the posterior ligament and a highly increased intradiscal pressure [29].

Risk factors for the neck angle, in relation to occupational exposure, suggest that muscle activity may rise with an increase in neck flexion angle. Hence, the use of overhead light and magnification loops is essential for reduced flexion.

Low back pain is common among dental professionals, including those who practice in a standing position [30]. This discomfort can result from prolonged standing, leaning over patients, or maintaining an awkward position that strains the lower back excessively. Dividing the procedures into several short visits will reduce low back pain as a prevention strategy, such as in Cases 2 and 3, where management techniques are crucial for dental practitioners to maintain their health and career longevity.

While sitting, ensure that the equipment is set up to promote good posture. Accessibility is a critical component with adjustable chairs and stools that support the lower back. 19°–54° of forward trunk inclination increases disc pressures considerably compared to standing [31]. Hence, failure to monitor the occlusal plane results in poor operator postures. Patients may be uncooperative and unresponsive, and this is also considered a difficult dental home that may require operator attention.

4. Conclusions

Dental professionals should practice the most effective and ergonomically sound standing or sitting position in dental homes. Continuous risk assessment, education on ergonomics, and exercises

are encouraged to prevent occupational injuries.

In difficult positions, split the procedures into consecutive visits and prioritize pain management visits. Orient the assistant and the instruments by zones to improve accessibility and reduce strain. Orient the patient's head in both vertical and anteroposterior planes to the best possible accessible position, depending on the procedure. To prevent neck and shoulder strain, exercises are designed to alleviate tension, improve flexibility, and strengthen neck muscles. Implement these exercises 2–3 times a day, especially during breaks or after long periods of practice, gently and without forcing the movement to avoid injury, reduce neck strain, and improve overall posture and well-being [9].

Use of AI tools declaration

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

Conflict of interest

Aliaa A. Khadre is an editorial board member for *Journal of Dentistry and Multidisciplinary Sciences* and was not involved in the editorial review or the decision to publish this article. The authors declare no conflict of interest.

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